AUG 5 1930

NATURAL HISTORY

July-August
1930

Price Fifty
Cents

THE OSPREY STRIKES

JOURNAL OF THE AMERICAN
MUSEUM OF NATURAL HISTORY

NEW YORK, N. Y.

THE AMERICAN MUSEUM OF NATURAL HISTORY

Scientific Staff for 1930

HENRY FAIRFIELD OSBORN, LL.D., President
GEORGE H. SHERWOOD, ED.D., Director and Executive Secretary
JAMES L. CLARK, Assistant Director, Preparation
WAYNE M. FAUNCE, Sc.B., Assistant to the Director and Assistant Secretary

I. DIVISION OF MINERALOGY, GEOLOGY, GEOGRAPHY, AND ASTRONOMY

HENRY FAIRFIELD OSBORN, LL.D., D.Sc., Curator-in-Chief

Astronomy

CLYDE FISHER, PH.D., LL.D., Curator

Minerals and Gems

HERBERT P. WHITLOCK, C.E., Curator
GEORGE F. KUNZ, PH.D., Research Associate in Gems

History of the Earth

HENRY FAIRFIELD OSBORN, LL.D., D.Sc., Honorary Curator-in-Chief
CHILDS FRICK, B.S., Honorary Curator of late Tertiary and Quaternary Mammals

Fossil Vertebrates

WALTER GRANGER, Curator of Fossil Mammals
BARNUM BROWN, A.B., Curator of Fossil Reptiles
G. G. SIMPSON, PH.D., Associate Curator of Vertebrate Palæontology
CHARLES C. MOOK, PH.D., Associate Curator of Geology and Palæontology
RACHEL A. HUSBAND, Staff Assistant
WILLIAM K. GREGORY, PH.D., Research Associate in Palæontology
WALTER W. HOLMES, Field Associate in Palæontology

Geology and Fossil Invertebrates

CHESTER A. REEDS, PH.D., Curator

II. DIVISION OF ZOÖLOGY, AND ZOÖGEOGRAPHY

FRANK MICHLER CHAPMAN, Sc.D., N.A.S., Curator-in-Chief

Marine Life

ROY WALDO MINER, PH.D., Sc.D., Curator
WILLARD G. VAN NAME, PH.D., Associate Curator
FRANK J. MYERS, Research Associate in Rotifera
HORACE W. STUNKARD, PH.D., Research Associate in Parasitology
A. L. TREADWELL, PH.D., Research Associate in Annulata

Insect Life

FRANK E. LUTZ, PH.D., Curator
A. J. MUTCHLER, Associate Curator of Coleoptera
C. H. CURRAN, M.A., Assistant Curator
FRANK E. WATSON, B.S., Staff Assistant in Lepidoptera
WILLIAM M. WHEELER, PH.D., Research Associate in Social Insects
CHARLES W. LENG, B.S., Research Associate in Coleoptera
HERBERT F. SCHWARZ, A.M., Research Associate in Hymenoptera

Fishes

WILLIAM K. GREGORY, PH.D., Curator
JOHN T. NICHOLS, A.B., Curator of Recent Fishes
E. W. GUDGER, PH.D., Bibliographer and Associate

Fishes (continued)

FRANCESCA R. LAMONTE, A.B., Assistant Curator
CHARLES H. TOWNSEND, Sc.D., Research Associate
C. M. BREDEH, JR., Research Associate
VAN CAMPEN HEILNER, M.Sc., Field Representative
LOUIS HUSSAKOF, PH.D., Research Associate in Devonian Fishes

Amphibians and Reptiles, and Experimental Biology

G. KINGSLEY NOBLE, PH.D., Curator
CLIFFORD H. POPE, B.A., Assistant Curator
CHARLES E. BURT, M.S., Assistant Curator
BERTRAM G. SMITH, PH.D., Research Associate
WILLIAM DOUGLAS BURDEN, A.M., Research Associate
FRANK S. MATHEWS, M.D., Research Associate
HOMER W. SMITH, Sc.D., Research Associate
O. M. HELFF, PH.D., Research Associate

Birds

FRANK M. CHAPMAN, Sc.D., Curator-in-Chief
ROBERT CUSHMAN MURPHY, D.Sc., Curator of Oceanic Birds
JAMES P. CHAPIN, PH.D., Associate Curator of Birds of the Eastern Hemisphere
JOHN T. ZIMMER, B.S., M.A., Associate Curator of Birds of the Western Hemisphere
ELSIE M. B. NAUMBURG, Research Associate

Mammals of the World

H. E. ANTHONY, M.A., Curator
ROBERT T. HATT, A.M., Assistant Curator
GEORGE G. GOODWIN, Assistant Curator
WILLIAM J. MORDEN, PH.B., Field Associate

Comparative and Human Anatomy

WILLIAM K. GREGORY, PH.D., Curator
H. C. RAVEN, Associate Curator
S. H. CHUBB, Associate Curator
MARCELLE ROIGNEAU, Staff Assistant
J. HOWARD MCGREGOR, PH.D., Research Associate in Human Anatomy
DUDLEY J. MORTON, M.D., Research Associate

III. DIVISION OF ANTHROPOLOGY

CLARK WISSLER, PH.D., LL.D., Curator-in-Chief

Science of Man

CLARK WISSLER, PH.D., LL.D., Curator-in-Chief
N. C. NELSON, M.L., Curator of Prehistoric Archæology
GEORGE C. VAILLANT, PH.D., Associate Curator of Mexican Archæology
HARRY L. SHAPIRO, PH.D., Assistant Curator of Physical Anthropology
MARGARET MEAD, PH.D., Assistant Curator of Ethnology

Science of Man (continued)

RONALD L. OLSON, PH.D., Assistant Curator of South American Archæology
WILLIAM K. GREGORY, PH.D., Associate in Physical Anthropology
CLARENCE L. HAY, A.M., Research Associate in Mexican and Central American Archæology
MILO HELLMAN, D.D.S., Research Associate in Physical Anthropology
GEORGE E. BREWER, M.D., Research Associate in Somatic Anthropology

IV. DIVISION OF ASIATIC EXPLORATION AND RESEARCH

ROY CHAPMAN ANDREWS, Sc.D., Curator-in-Chief
WALTER GRANGER, Curator in Palæontology
CHARLES P. BERKEY, PH.D., [Columbia University], Research Associate in Geology
AMADEUS W. GRABAU, S.D., [Geological Survey of China], Research Associate

V. DIVISION OF EDUCATION AND PUBLICATION

GEORGE H. SHERWOOD, ED.D., Curator-in-Chief

Library and Publications

IDA RICHARDSON HOOD, A.B., Acting Curator
HAZEL GAY, Assistant Librarian
JANNETTE MAY LUCAS, B.S., Assistant Librarian—Osborn Library

Education and Public Health

GEORGE H. SHERWOOD, ED.D., Curator-in-Chief
CLYDE FISHER, PH.D., LL.D., Curator of Visual Instruction
GRACE FISHER RAMSEY, Associate Curator
WILLIAM H. CARR, Assistant Curator
NANCY TRUE, A.B., Staff Assistant
ELIZABETH A. ECKELS, PH.B., Staff Assistant
PAUL B. MANN, A.M., Associate in Education
FRANK E. LUTZ, PH.D., Research Associate in Outdoor Education

---

CHARLES-EDWARD AMORY WINSLOW, D.P.H., Honorary Curator of Public Health

---

Printing and Publishing

HAWTHORNE DANIEL, Curator, Editor of *Natural History*
A. KATHERINE BERGER, Associate Editor of *Natural History*
ETHEL J. TIMONIER, Associate Editor of Scientific Publications

Public Information

GEORGE N. PINDAR, Chairman
GEORGE H. SHERWOOD, A.M., ED.D.
WILLIAM K. GREGORY, PH.D.
WAYNE M. FAUNCE, Sc.B.
CLARK WISSLER, PH.D.
HAWTHORNE DANIEL

Advisory Committee on Natural History Magazine

HAWTHORNE DANIEL, Chairman

HENRY FAIRFIELD OSBORN, LL.D., D. Sc.
CLARK WISSLER, PH.D., LL.D.
GEORGE N. PINDAR
FRANK M. CHAPMAN, Sc.D.
FRANK E. LUTZ, PH.D.
GEORGE H. SHERWOOD, ED.D., *ex-officio*

A. KATHERINE BERGER

VOLUME XXX
NUMBER 4

NATURAL HISTORY

JULY-AUGUST
1930

The Journal of The American Museum of Natural History

HAWTHORNE DANIEL
Editor

A. KATHERINE BERGER
Associate Editor

CONTENTS

THE OSPREY STRIKES ..... *Cover*
From a Painting by Francis L. Jaques (See Page 448)

THE GATE OF ITSUKUSHIMA TEMPLE AT EBB TIDE ..... *Frontispiece*

PHOTOGRAPHING THE OSPREYS OF GARDINER'S ISLAND ... CAPT. C. W. R. KNIGHT 339
Intimate Studies of the Most Dramatic of All the Sea Hawks

WITH BRUSH AND PALETTE IN THE SOUTH SEAS ..... CAROLINE MYTINGER 349
An Artist Visits the Melanesian Islands

CAMPING IN A PREHISTORIC FOREST ..... H. E. ANTHONY 367
Among Trees That Trace Their Ancestry Back 200,000,000 Years

SHINTO—THE WAY OF THE GODS ..... S. ICHIKAWA 377
The Ancient Cult of the Islands of Japan

AQUATIC INSECT PETS ..... FRANK E. LUTZ 389
How to Make and Maintain an Insect Aquarium at Home

THE MOUND BUILDERS ..... H. C. SHETRONE 402
Part Two of an Article on an Ancient American Civilization

DIGGING FOR LIZARD NESTS ..... WILLIAM G. HASSLER 409
Collector's Luck in the Forests and Deserts of the Dominican Republic

DESERT ROSES ..... HERBERT P. WHITLOCK 421
Strange Groups of Crystals Deposited by the Ground Waters of the Deserts

ALTAMIRA—THE CAVERN OF THE STONE AGE ARTISTS ..... HUGO OBERMAIER 426
The Extraordinary Spanish Cave Containing Paintings of Animals of Preshistoric Times

THE AUSTRALIAN BOOMERANG ..... EDGAR R. WAITE 435
Two Types of Throwing Sticks Used by the Natives of the Island Continent

AMERICAN MUSEUM EXPEDITIONS AND NOTES 438

Published bimonthly by The American Museum of Natural History, New York, N. Y. Subscription price $3.00 a year.

Subscriptions should be addressed to James H. Perkins, Treasurer, American Museum of Natural History, 77th St. and Central Park West, New York, N. Y.

NATURAL HISTORY *is sent to all members of the American Museum as one of the privileges of membership.*

Entered as second-class matter April 3, 1919, at the Post Office at New York, New York, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on July 15, 1918.

Copyright, 1930, by The American Museum of Natural History, New York

© L. Green from Publishers Photo Service

THE GATE OF ITSUKUSHIMA TEMPLE AT EBB TIDE

This "torii," as Japanese temple gates are called, is situated at the western end of the Inland Sea, Japan. It is unique as the only "torii" built standing in water, and this spot is considered one of the three most beautiful in Japan. The temple to which this gate is an entrance is just to the left of the picture

VOLUME XXX

NATURAL HISTORY

NUMBER FOUR

JULY-AUGUST, 1930

PHOTOGRAPHING THE OSPREYS OF GARDINER'S ISLAND

Intimate Studies of the Most Dramatic of All the Sea Hawks

By CAPT. C. W. R. KNIGHT, M.C., F.R.P.S., F.Z.S.

TWENTY years ago the osprey, or fish hawk, became extinct as a British nesting species.

At one time quite a number of pairs nested annually in various parts of Scotland and aroused a good deal of interest by the beauty of their flight, the dramatic surroundings of the nest—which was usually built on an island in the midst of a loch—and by their habit of crashing into the sea and catching the fish upon which they live.

Without question their end was entirely due to the persistence of collectors, who, in Great Britain at least, are generally ready to pay large sums of money for clutches of eggs, and sometimes the skins, of *really rare* birds.

Barbed wire still drapes the trunk of an oak tree on the little island that is surrounded by the waters of Loch Arkaig in Inverness-shire. It was put there by the owner of the place in the hope of frustrating the activities of egg collectors; an admirable move but one which unhappily did not achieve its purpose, and the ospreys, weary no doubt of the futility of attempting to rear a family, betook themselves to less hazardous retreats.

By such misguided enthusiasm was the osprey—most dramatic of all the sea hawks—exterminated as a British nesting species.

In order to obtain really intimate studies of this unique bird, I spent last summer on Gardiner's Island, New York, where the most remarkable osprey colony in the world enjoys a primeval freedom. This happy state of affairs is due to the consideration and interest of Mr. Lyon Gardiner, who owns it, and of Mr. Clarence H. Mackay, who leases the island. Some 300 or 400 ospreys nest there annually, and because of ideal conditions, the birds build in the queerest situations. One sees the enormous nests at the tops of tall trees—trees that not infrequently collapse under the great weight, on bushes a few feet high, on upturned tree roots, on rocks, on walls, and even on the seashore itself.

From such a vast selection I decided—after a week's indecision—to concentrate on a nest that was admirably suited to photography. It was also the home of a comparatively amenable pair of ospreys—a most important factor. Generally speaking, the birds are nervous and wary,

CAPT. C. W. R. KNIGHT AT HOME IN ENGLAND
In the foreground are four American ospreys obtained in Clarence Mackay's bird sanctuary on Long Island, and released in Scotland in an attempt to establish them as resident breeders in place of the now extinct native ospreys. The bird on Captain Knight's hand is his tame golden eagle

and difficult to approach; in fact, I had to build a carefully camouflaged "hide" to obtain views of the birds approaching and leaving various nesting positions, such "hides" usually being set up from twenty to forty yards from the nest.

Now I made preparations for *real* photography—for the filming of the intimate family life of the osprey from egg to maturity. That close-up studies might be had, I built the hiding place only eighteen feet from the nest.

A vast amount of care and hard work was bestowed on these preliminaries. First, all sorts of wreckage found along the beach was piled in a great heap—the rough semblance of the "hide" that would one day—I trusted—conceal the camera and me. As the birds grew accustomed to the nearness of this heap to their home, the size was gradually increased. Almost every day fresh débris was piled on it. Most important, tin cans were strung on a line between two posts—their tinkling and jangling at first astonishing the female osprey but ultimately preparing her for the whirr of the movie camera. Thus the size and efficiency of the hiding place slowly developed—always with the possibility of the osprey's resentment uppermost in my mind.

At last it was completed—firmly built, roomy, and more or less waterproof. On the outside it was effectually camouflaged by seaweed, wreckage, and leafy branches. When my companion and I had fixed the camera in position and had made everything ready for photography, we retired to a distance to watch develop-

ments. We were, of course, apprehensive that our subject might turn out to be of a suspicious, worrisome disposition, and that our efforts to beguile her would be in vain. Breathlessly we watched her glide toward the nest, alight, settle down to brood her three eggs. Of our hiding place and the jangling of the tin-can music she remained in apparent oblivion. The stage was set! The great moment had arrived!

The next day I attempted close-up photographs of the family. My companion accompanied me to the hide to help outwit the parent birds. When everything was arranged, he walked away, making his departure as obvious as possible, hoping thereby to divert the attention of the birds from the fact that I still remained.

I do not know whether ospreys count or not, but things, to my relief, proceeded according to expectations, and I secured the first of my long-sought-for records.

In due course the three young ospreys hatched — little fellows covered with prettily marked brownish down, rather like young pheasants. While the female brooded them, the snowy-breasted male perched on the stick behind the nest to complete the family group. Presently he flew away to return later with a large fish—weighing probably three or four pounds. The female took this from him and distributed tiny pieces among the little ones. Her extreme gentleness as she did so can be compared only to that of the golden eagle as she feeds her young. Such a fierce-looking, wild-eyed creature, and yet so absolutely tender! During the whole of this scene the male osprey remained on the nest as though deeply interested in the proceedings.

IN STRANGE SURROUNDINGS

One of the American ospreys after arrival in England. The birds were liberated on the little island in the Scottish Loch where ospreys nested twenty years ago

APPROACHING THE NEST

An osprey at home on Gardiner's Island, New York. This and the following three pictures show the bird returning to its nest. Photographed from a blind at a distance of eighteen feet from the nest

A LITTLE NEARER TO ITS HOME

Owing to ideal conditions, the birds build in the queerest situations, and nesting sites range from the ground to the tops of tall trees. This nest was constructed on the ground

ARRIVAL AT THE NEST

The osprey above its nest, ready to settle on the edge. Generally speaking, the birds are nervous and wary, but this one seemed apparently oblivious of the photographic blind and its human observer

AT HOME

The osprey standing at the rim of its nest, its feathers still ruffled from its flight. The size of the pile of sticks forming the structure of the nest is well shown by this photograph

FEMALE OSPREY FEEDING THE BABIES
Recently hatched young receiving bits of fish brought by the old male

Since the inhabitants of the island were Scotch, and the osprey was, originally, a Scottish bird, we christened the three young ones with Scottish names—Jamie, Jean, and Jock, all of them beautiful to look at, but Jamie rather less vivacious than the others. Jean and Jock, in fact, were so full of boisterous liveliness that, in the end, they came to blows. For a while it looked as though I was to witness a repetition of the tragedy I had filmed on the eagle's nest, when one of the young eagles had killed the other. They certainly went at it in the most determined way. The mother osprey, meanwhile, took no interest in the fact that Jean was giving Jock such a beating, and allowed the youngsters to fight it out.

From now on, Jamie, Jean and Jock spent most of the time doing physical exercises—"Upward jumping with wings flapping sideways," and so on, and were obviously ready to leave the nest at any moment. Jock was the first to leave home and on his first flight soared into the distance. A few days later the nest was empty. The young ospreys were learning to fend for themselves.

The osprey subsists entirely upon fish, and one of my main ambitions was to secure pictures of the great bird plunging into the water and emerging with the fish in its talons. I spent much time in considering the situation, in devising ways and means whereby I might achieve my purpose, and I wasted much time in trying out my conclusions.

In the end I decided to try for a picture of the birds as they hovered over the sea and crashed into the waves—for they fished far more frequently in the sea than they did in fresh water. I don't like to think how many days were spent in weary waiting, hoping that one of the birds would oblige by diving "in the picture." In the end, with the help of a

A MEAL IN SIGHT
The female osprey and the half grown young perched on the rim of the nest awaiting the arrival of the male with a fish

telephoto lens of 15 inch focus, I achieved something like success—the headlong crash into the water, the period of entire submersion, the "rouse" (as falconers say) to get rid of waterdrops, and the homeward journey.

Interesting forms of life abound on this semi-tropical Island, giant grape vines that entwine themselves among the branches of the tallest trees, cacti, slow-moving tortoises, elusive butterflies, evil-looking turtles that bury their eggs in the sand, exquisite little night herons that persist in nesting in trees already occupied by ospreys—a curious phenomenon when one knows how cordially the ospreys detest the herons.

To see an osprey's "stoop" at a heron was a common enough sight. Usually the little heron shifted from the stoop, but sometimes would leave it until too late and receive such a blow from the great talons as to put it out of action—a blow that on rare occasions proved to be fatal.

In bygone days when falconry — the sport of catching various kinds of

MALE OSPREY RETURNING WITH FOOD
The male bird has just arrived with a fish which the female is about to tear into pieces and distribute to the young, whose heads can just be seen in the hollow of the nest

CROWDED QUARTERS

The three young ospreys are now too large to share the cavity of the nest with comfort, and one of them has sought more freedom on the spacious rim. The female parent is perching on an adjacent stick

game with trained hawks—was so popular in Great Britain, the osprey (according to the authority, Richard Blome) was used as a trained falcon, for taking "fish and teal." Judging by its prowess where herons were concerned, there is no reason why it should not have been.

It is difficult to understand why the night herons should have chosen to nest in such close proximity to the ospreys, and it is equally difficult to explain why certain other birds also made a point of sharing their company, unless they had secret confidence in their big neighbor.

In the foundations of an osprey's nest at the top of a tall oak tree, no fewer than five grackles' nests were built! While the female osprey was brooding her eggs, one of the grackles came home to her flat down below—as it were—and fed her family. The osprey looked down on the proceedings in quite a kindly way, although the grackle continually peered up over the edge of the nest to see how she was taking things.

One might really conclude that the

FEEDING OVER-GROWN BABIES

Although nearly as large as the parents, the young are still fed by them. In the photograph the female is shown distributing portions of a fish to the nearly full grown offspring

READY TO FLY

Young ospreys about to leave the nest on the initial flight

BEGINNING LIFE IN A NEW HOME

One of the young ospreys brought from America and released on Loch Arkaig. The bird has in its possession a fish which has been given to it

grackle had built her nest under the eye of the osprey on account of the protection such a position might afford. Certainly the osprey bore her neighbor no ill will.

In the hope of re-introducing the osprey into Scotland, I took home with me two pairs of the birds—two females and two males—all from different nests.

I liberated them on that little island in the Scottish Loch where ospreys nested twenty years ago, and where every protection will be afforded them. It is to be hoped that they will remain in that neighborhood and that they will one day nest in some situation inaccessible to the collectors.

THE FUTURE HOME OF THE COLONISTS

Island in Loch Arkaig, Inverness-shire, Scotland, where the four American ospreys were released. The large tree in the center of the island formerly held the nest of a European osprey, the last known breeding place of the species in Great Britain

A Papuan Native

WITH BRUSH AND PALETTE IN THE SOUTH SEAS

An Artist Visits the Melanesian Islands to Paint the Natives

By CAROLINE MYTINGER

On the mainland of New Guinea and on the neighboring islands, there are many different native peoples with marked physical characteristics and distinctive cultures. These people have as yet been little influenced by white contact; they preserve not only their physical type but their modes of body ornamentation, their peculiar customs such as scarification or head shaping. Most fortunately for anthropologists, Miss Caroline Mytinger realized what vivid results could be obtained by painting these people. In the face of many discouragements and difficulties, she went to New Guinea and brought back these unique portraits of primitive peoples who in a few generations will have lost their cultural identity. She has caught those traits of personality which the camera and the pen are less skilful in reproducing.—The Editors.

"WHAT did the native think of his picture?" Since there is a fairly prevalent idea among those in closest contact—the planter and government official—that there is a minimum of thought among natives, it cannot be said definitely that certain reactions observed were the result of mental functioning.

If this were wit, I should like to believe, rather, that the general hilarity produced by a "first viewing" was directed at the model and not at my work. Usually, in sophisticated villages, as soon as the painting developed to the point of being an unmistakable likeness, the crowd of villagers, both adult and children, who had assembled at the beginning of the first sitting and remained from that time on, shouted with mirth. This always affected the fifteen or twenty small yellow dogs present who added to the criticism a series of prolonged coyote-like howls. The remarks directed at the model must have been anything but gratifying, for he usually squirmed and looked harassed, and more often than not took the next rest as an opportunity to round the corner of a hut and disappear. Sometimes this absence was permanent, but if he was recaptured, even the most irresistible of bribes failed to induce him to continue the pose.

In time, in order to avoid this trial, I learned to leave the painting of the face to the very last, making headless torsos festooned in the haunted splendor of dog's teeth necklaces, and even proceeding to decorate hair and ears before the final sitting when I knew laughter would put an end to the pose. This method produced a silent and altogether satisfactory awe.

Derision is, apparently, the hardest of all crosses to bear, and with such a precedent established, it became a problem to get another native to substitute long enough to finish the painting. Consequently, many a canvas has been scrapped or, worse, carried on to another village to be continued from a model yet unaware of the torture involved in sitting for a portrait.

Furthermore, laughter and sorcery "talk-talk" are heard a long way in "the islands," and not infrequently my reputation preceded me with crushing results. An extreme case was that which occurred on Guadalcanar in the British Solomon Islands. At a village near Ruavatu on the eastern coast, I began a study of a young, rather personable mother and her overgrown baby, both of whom, at the beginning of the painting, were apparently healthy citizens. Due to the restiveness of the child, who screamed every time it woke and caught me looking at it, I was unable to make any progress during the first sitting.

Upon my return to the village the following morning, after a walk of more than three miles along an unsheltered beach, from the plantation where I was stopping,

MOROVO LAGOON FAMILY

The son, who is by far the most important member of the family, wears on his head the "dollah," a clam-shell disk covered by an intricately carved filigree of tortoise shell. These have become so rare today that they cannot be purchased from natives who still own them. The shield is for war and war dances, and its design is probably borrowed from the eastern islands. The "battle-axe," having descended in the family with the other heirlooms, was a highly prized possession

MEMORIAL CORROBOREE

Depending on the locality, any time from six months to a year following a death, a dance and feast are held at the grave to commemorate the deceased. The designs on the grave poles erected by the relatives have no special significance, though some of the patterns are the same as those used for "paper talk" and signify variously, rabbit tracks, yams, the sun, a lizard, and so on

my subjects were nowhere to be found. Lowered mats at the doors of the huts usually meant that the tenants were asleep, but a round of the village, slapping at the doors, failed to rouse even a dog. Nevertheless, I squatted under a tree and prepared for a vulturous wait. In a few minutes the heat and stillness put to sleep even the fleas on my terrier, and I was left to a not too gratifying speculation on the variability of the Melanesian temperament in its relation to art.

Minutes passed, and then, ever so slyly, the mat of a door near by was raised, and a woolly head popped out and withdrew like a clock cuckoo, a suddenly released dog barked and wakened the terrier, who, with the natural reaction of a "white man's dog" to a "black man's dog" leaped to the source of the insult. In the battle which followed and exposed the whole village, I managed to secure my model who, unable to refuse a request made directly to her, consented to continue the pose for the remainder of the morning. So far this was only a case of comfortable disinclination to work, fostered by a sympathetic village, but it grew into a superstition by the end of a sitting, made hideous by the dirge of the youngster.

Almost as I had expected, my model was missing the following morning and every morning after that. I continued

to haunt the community making sketches of the huts and the dogs, learning to shoot with a bow and arrow, but in the end succeeding in making friends with only one person, the former "housekeeper" of a planter and now "public woman of the village." She confessed that in spite of this being a mission village, it was the general opinion of all that I had put "puri-puri" on the baby, whose unprecedented howls and copious tears since the first sitting could be accounted for in no way except by witchcraft. It occurred to me that the chewing gum, which had kept it preoccupied for half an hour during the first pose, might have been swallowed with uncomfortable results, but this couldn't be explained, and there was nothing to do but exit with as much satisfaction as could be wrested from my new rôle as sorceress.

Not long after this, I removed to a plantation forty or fifty miles westward up the coast. After the usual pre-

THE WEAVER

The weaving of mats on Ontong Java is done by the men, though, since the advent of the missionary and trade stores, the observance of the custom of assigning work is not so strictly marked as in the old days. The man's ornament is carved from tortoise shell. Sometimes these ornaments are so large that they must be tied back to the ear to permit passage of food to the mouth

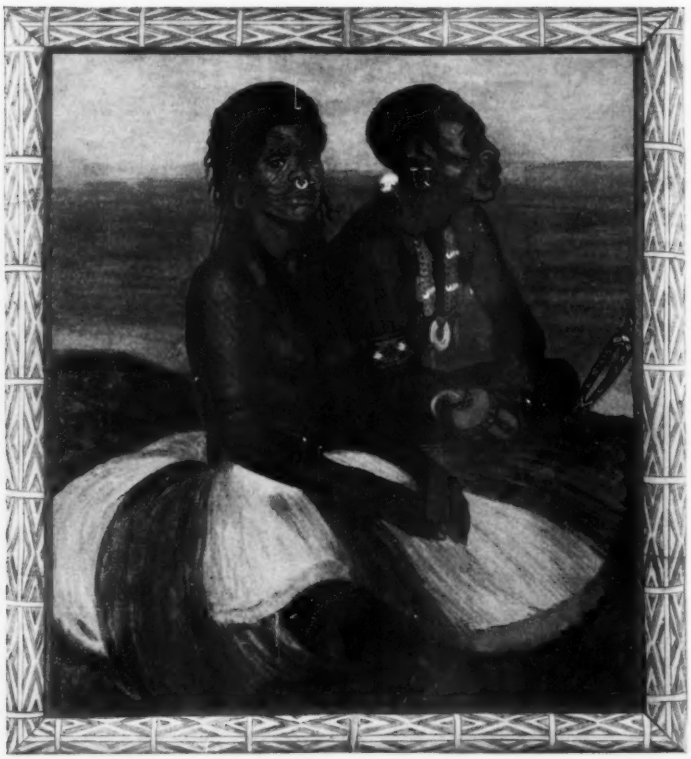
TOBOBAU'S MARY AND PICCANINNY

Before the natives enjoyed government protection, it was necessary, for safety, for the men to escort their women to and from the gardens, which were often a distance from the villages. This custom persists though the cause of it has long since been obliterated, and early in the morning, on the roads leading to Rabaul, where there is market every day, one encounters a procession composed of groups like the above. An idly fondled hibiscus has taken the place of the spear, face paint is applied to attract the attention of the opposite sex, and the hair assumes shapes and colors which could only be the result of opulent leisure. The gentleman above has bleached his hair with peroxide

liminary of being escorted to the nearest village by my host who explained to the natives what I wanted, I advanced, one sweltering morning, on the unsuspicious community with my unfinished canvas of Mother-and-Child. A new matron was induced to pose with her baby, but the following day when I returned, the "head man" greeted me with the expression of a disturbed symphony conductor. He was a mission "boy," he said, and as such he "savvied pi-lenty along white master and missus." He was quite as well aware of the fact that the government did not believe in nor tolerate sorcery, and yet here (indicating my picture) was the most complete case of unpunished crime which had ever come to his attention. At that time, the most that could be said for my pidgin English was that it was correct, but I eventually interpreted his jargon to mean that the village had long ago heard of me and my behavior in eastern Guadalcanar, but, not connecting such conduct with one of my social standing at Tanakombo, had actually exposed one of their number to my questionable influence. The old gentleman was a not inconsider-

MAIDEN AND SORCERESS

The girl is being dressed for the dance—rubbed with shredded coconut meat, and decked with heirlooms, franjapani blossoms, and certain remunerative herbs. The figure to the right is a "garden sorceress," who also happens to be the local tatoo artist



THE WIFE OF CHARLIE, H. M. S.

The natives of Rossel Island, in the Louisiade Archipelago, have long been notorious for cannibalism, the eating of human flesh having been ascribed to ritual respecting the memory of an important chief at his death. But even Sir Hubert Murray, the present governor of Papua, an ardent protector of native customs, admits that the disappearance of three hundred Chinese, wrecked on the coast of Rossel Island some years ago, is hard to account for with pious ceremony

HEAD OF WEDAU BOY

At Hanuabada, near Port Moresby, the most fashionable headdresses are those which rise to almost ten inches above the face and cover the whole of the back of the neck. Though the "boys" claim that protection from the sun and not vanity is the cause for the extravagance, much thought is devoted to its decoration. The Wedau boy resorts to a live butterfly which is discarded the moment it ceases to flutter

BUSH BOY AND SALT WATER BOY

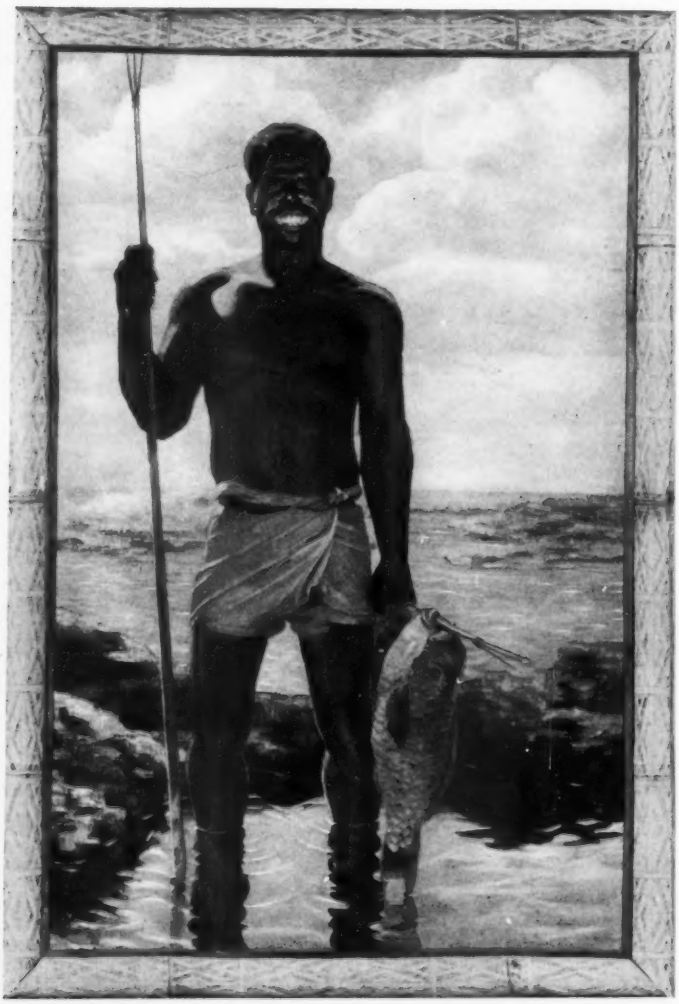
Natives of Malaita are preferred for labor on the plantations because of a tenacity of character that is lacking in the residents of the surrounding islands. Therefore, few of the coast or "salt water boys" have escaped indenture. In a period of generations, this has produced an attitude of superiority on their part toward the "bush" natives

able character, and work at Tanakombo would have been stopped, but for some atheistic plantation families whose only superstition was the shilling.

From the foregoing experiences, it can be seen that the community has a decided influence on the attitude of the sitter toward his portrait. Because of this, the ideal situation in which to work is as far from the settlement as possible. Since there is no isolated village building accessible to a woman in the Melanesian Islands, the best circumstances to be hoped for, in order to produce a natural expression and to observe natural reactions, is the veranda of a plantation house or the doorway of a copra shed. To a "studio" painter no humbler working conditions can be imagined than those which throw a flickering top light and constantly shifting reflections over both model and canvas, but these and the minor ordeals of insects, sun blindness, and sudden monsoon blows and rains, fade into insignificance before the problem of holding a model, either alseep or inhumanly bullied, until the completion of a study.

Under the calming influence of an isolated copra shed or rubber house, I have seen the native expand to an active interest in his picture. Squatting, in island fashion, on the heels, he gazes, his head a little to one side like a Victor dog, for possibly as long as five minutes, then still expressionless, he tips back off his heels on to his seat, closes his eyes and, . . . sleeps.

Criticisms of adornments, undoubtedly made in the same spirit which prompts a small European sitter to ask, "Where is the anchor on my sailor suit?" were not infrequent where the model was a native who had been emboldened by familiar contact with the

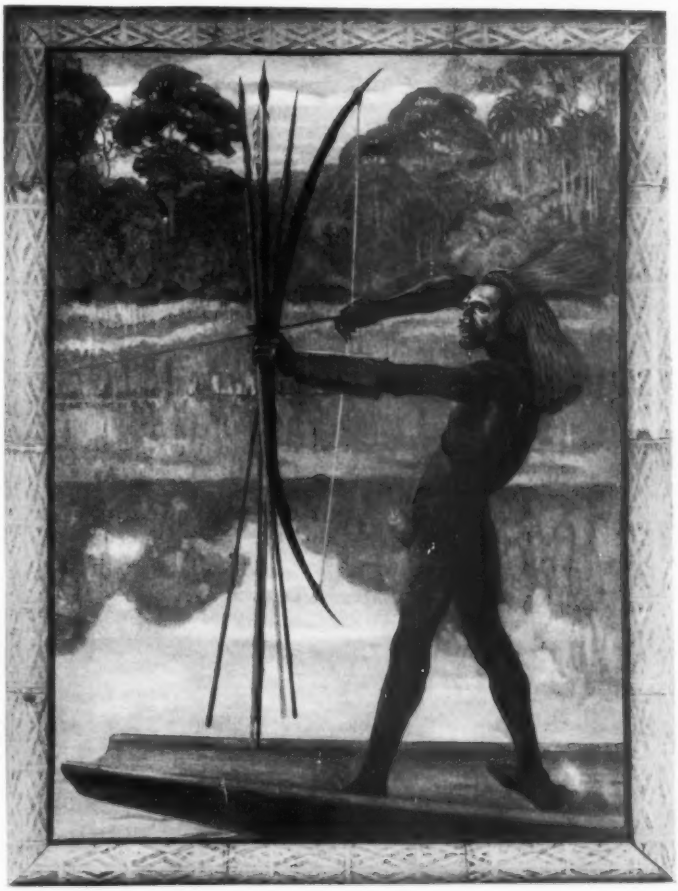


KAI-KAI

Kai-Kai is the native word for food or the verb "to eat." Magnificent parrot fish and lobsters, speared among the reefs of the Torres Straits Islands, are the principal diet of the islanders. Fish, especially the colorful parrot fish which deteriorates rapidly out of water, is eaten raw and without salt

"white master." The length of a dog-tooth necklace, still valuable currency in some localities, exactness of a tattooed or keloid pattern, where the model was familiar with his appearance through possession of a "trade" mirror, and size, color, and cut of the hair were vanities subject to correction.

There is a belief current among the European residents of these islands to the effect that a native does not recognize himself in a snapshot unless he holds the picture upside down. I have seen this demonstrated only once in an experience with two men who came into a dimly lit hut where I had retired from a storm and sat with the painting of one of their number propped *upside down* against the wall beside me. Though one of the men still blocked the light coming through the doorway, the first, much to my astonishment, immediately recognized and named the model for the study. His only comment was "Missus, he savvy too much,"—the commonest form of native flattery in the islands. The shrewd "salt water boy" had discovered, further, that by adding a few clucks meant to convey the extreme of amazement, tobacco and even leniency are forthcoming. I am convinced, however, that there is a minimum of worship bestowed on the proven race. Surprise is often expressed that something never before seen by a native should rouse in him so little awe, but a similar indifference to miracles may be found in our own casual acceptance of Nature.



TAUPARAUPI, HEAD-HUNTER

The significance of Semitic features appears more important after one has experienced the dignity and intelligence of such a personage as Tauparaupi, who, unable to communicate except by sign language, indicated quite plainly that at his home, far away, he had two children, a boy and a girl, for whom he was very homesick. He demonstrated this emotion by measuring off two heights and, with tears in his eyes, hugging a passing dog

Since the first trading and recruiting European, the "white master" has been obligingly performing miracles for the wonderment of "primitive" man; he made pebbles appear and disappear, took out his eye—if he happened to have a glass one—removed his leg, or his teeth, or struck fire from a small stick with one wave of his hand.

Apropos of native sophistication, a short

AHUIA IN DANCE REGALIA

A dance costume of "long time before." Only a few of these remain, due to the activities of the missions, who claimed that the bird-of-paradise feathers and the tail feathers on special sticks in the center of the headdress embodied sexual significance, which, as an article of clothing, was unbecoming to a Christian convert

MOTU SMOKERS

Tobacco was in use in these islands when the first Europeans of history landed. Cigarette holders and pipes are popular among the "town boys," but the bamboo tube—filled with smoke and then passed from hand to hand—is still the favorite cool smoke of the village native

HOHUA-TO-TAHAPANGO
A Polynesian family group from North Island, New Zealand

time preceding my arrival in the Solomon Islands, a seaplane, flying from Sydney, had arrived in the islands, "landing" in Tulagi Harbor, where it proceeded to emit human beings—or at least this is the romantic way we like to think it impressed the native. Certainly, it was enough of an event to interest even the most blasé, for a certain "house boy," long noted for his taciturnity in the face of any incredibility, came to his employer with the following:

"Master, me lookem long time before this fella steamer. He go; him he gottem sail. By and by me lookem this fella cart. He no gottem horse; he go. Now me lookem this fella he fly along sky all the same pigeon. He no gottem wing. Him he go. My word, white master, he savvy everything. Now, master, boy he die finish but boy he no savvy which way he go. Which way white master he go for die all the time?"

Beside this credited knowledge of immortality, what poor performances are the gramaphone, movies, and oil portraits, which develop without mystery before the eye!

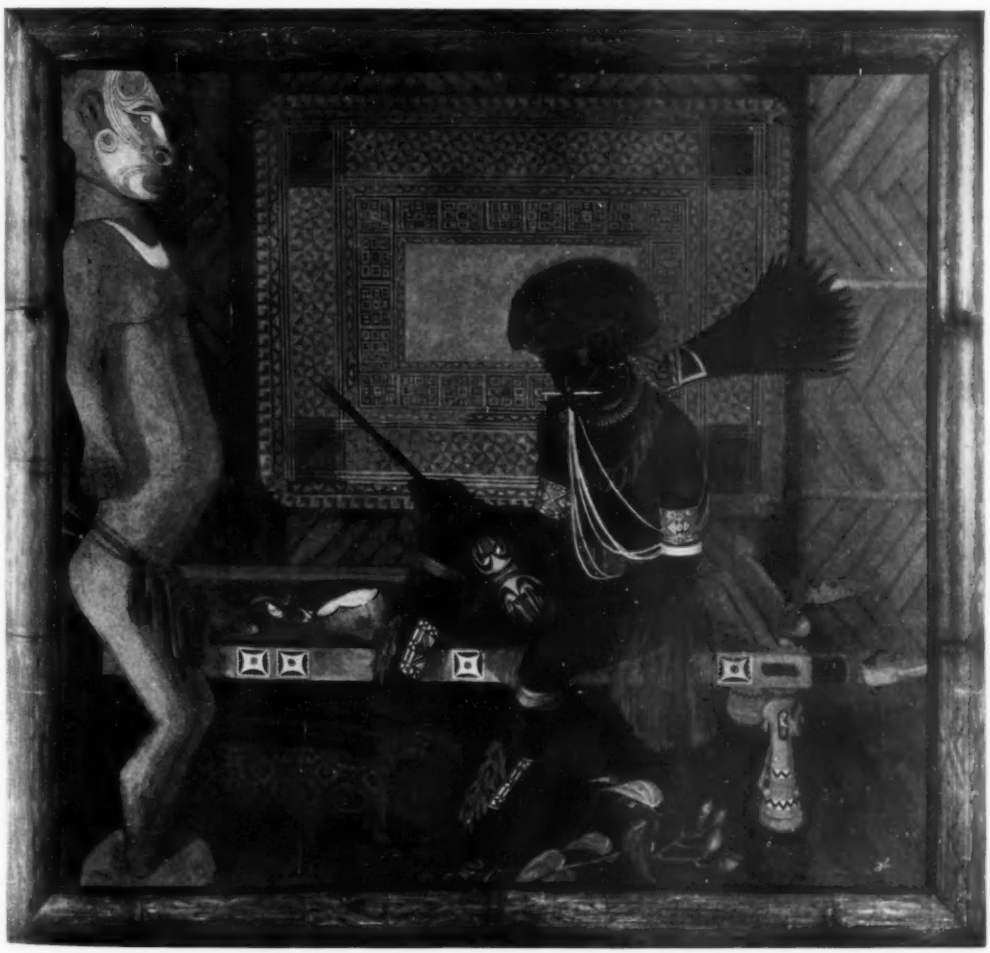
The attitude toward portraits and picture painting becomes a little more amusing, though no less trying, in localities where the native is unaccustomed to the ingenuity of our race. The relief of employing unsophisticated subjects is tempered by the new nightmare of genuine superstition, shyness, and indifference to popular bribes. Ordinarily, one stick of trade tobacco is a considerable inducement to any native, regardless of sex or age, and this cannot be considered mean wages for a morning's sitting, in view of the fact that the average return for a year's labor on a plantation is only about twenty-five dollars, and perhaps a hundred sticks of tobacco. However, in a territory where there are no trade stores, and no money with which to buy tobacco if there were stores, the weed is grown in the gardens, cultivated by the women, thereby losing proportionately in value.

Unprocurable stock, such as beads, safety pins, cigarette tins, the tops of

which are used for mirrors and razors, increase in value, and such things as a large pearl button or a film tin, which can be worn in the ear, are kept locked in a treasure box for particularly stubborn cases.

A most highly prized remuneration from this box was paid to "Dirivo," who posed for the canvas by that name. She was chosen not so much for her physical beauty, as for her deformities, which were the particularly vicious keloids on her upper body and arms. She was a "bush-Mary true" from Kiwai Island at the mouth of the Fly River, Papua, and she objected to posing because she objected to bathing, and one necessitated the other. She sulked and complained, rose rheumatically from the poses and walked about like a cripple during the rests, until her husband, the "boss rubber boy" who had just paid a couple of pigs for her, refused to force her into posing any longer lest her claim that I was laming her prove authentic. At this point the "bokkis" was unlocked and from its depths was extracted the most ornate cast-off garter girdle (with four tinkling garters) as ever graced a refuse barrel.

With the belt hung over her grass



A MANUS INTERIOR
Manus is the largest of the islands known as the Admiralty Group

SEPIK RIVER BOY WITH NAKANAI SHIELD

A typical "bush" native from the north of New Guinea mainland, where a surprisingly decorative effect is obtained by scarification. Designs employed have none other than pictorial significance, and often represent a bird's foot, a scorpion, or a lizard. A long-pronged wooden comb is carried by these people for the purpose of scratching the head under the hat, which, as far as could be determined, is never removed

OLD WOMAN

The subject of this crayon drawing was one of those who caused considerable consternation by disappearing in the middle of a morning's work and remaining absent until marched back by the village "head man"

A VILLAGE COUNCILLOR

An experiment in native self-government is being tried with some success at Hanuabada under the guidance of the Administration. Old villagers, such as the subject of the accompanying picture, meet periodically to settle such common village crimes as theft and adultery. If an agreement cannot be reached, the matter is passed on to the Port Moresby Court, but so great is the responsibility felt by those appointed for the Council, that very few cases are released without a decision

BEAU

The boys, as as the well girls, of these dark-skinned people are sometimes quite beautiful, being well proportioned and of a rich purplish-brown color. By contrast, the "white" of the eyes seems to possess less of the Melanesian "tone," appearing more nearly similar to that of the eyes of our American negro

petticoat, she posed uncomplainingly for two days, then, as a direct result of having defied conventions by permitting me to capture her "shadow," she developed a yaw in her nostril, and I was forced to finish the study from a most reprehensible old character who was serving as "cook" for six of the plantation boys. She, in turn, developed a real or imaginary sleeping sickness, which incapacitated her for her legitimate use, and which placed me in a most questionable position for the following six weeks preceding my departure. Nothing the treasure "bokkis" contained held any weight against public opinion and again I had to content myself with architecture and philosophy.

Though all "primitives" seem to have an unexpectedly well developed commercial sense, I encountered only a few instances where money was preferred over "trade goods" as payment for posing. The latter fell into disuse in the Polynesian islands many years ago; nevertheless, it was startling to be asked by a Maori gentleman living in a dugout several miles from civilization, for fees equivalent to those paid to the most popular New York models!

Natives often pose unusually well, partly because they are natural "sitters" and partly because they sit naturally—so natural, in fact, that keeping them awake proved almost as great an obstruction to accomplishment as getting them to pose. Not infrequently a small boy was employed for the double duty of shooing flies and slapping the model awake with the same palm frond. A "boy" chosen for his fine carriage and muscular development usually sank into a characterless lump of brown fat, which

DIRIVO

The carved and painted figure used as a background is similar to that erected in an enclosure in the ceremony employed to promote the fertility of the gardens—a ceremony which cannot be disassociated from certain women in the village

would unfold only under an appeal to his vanity. By fiercely thrusting out my own chin and hissing "Big fella too much" the model could be coerced into assuming that expression of savage nobility poetically ascribed to primitive peoples, which they not infrequently do possess when in action.

The finest model, either European or native, I have ever had was the Papuan Tauparaupi, who posed for the picture on page 357. He was one of forty leaders of a head-hunting raid, which took the party down the Fly River to within a few miles of civilization. When I painted him, he was "in jail" at the government station of Daru, being taught, in the kindly British fashion, the rudiments of a common language and the gastronomic refinements of rice over human flesh. Probably only a portrait painter can understand the gratification with which I saw him assume the difficult pose of poised bow and arrow, returning after each rest—which he took, without suggestion, when tired—to the marks chalked for his feet, pointing his arrow to exactly the same place and with the same realistic intent which marked the first pose. Tauparaupi, the primitive, with whom I had no means of communication except by sign language, and to whom a picture of any sort

SING-SING

The above illustrates the dance at the initiation of the young boys of the community into a secret society. These affairs are never witnessed by women or young children, and this painting was only made possible because of the assistance of the Rabaul Museum, which lent the mask

must have been a mystery, is still the unexplained marvel of my experience. And though he posed with inspiration, the painting of himself, being in profile, left him unmoved. His friends, on the other hand, when brought to view it, whistled and clucked with excitement. Later, when the canvas was taken up to the Pink Lagoon for a background, the people of Tauparaupi's village saw it from the bank on the after deck of the schooner, and became so interested that one of their number was invited on board to examine it. He did so reluctantly, and had to be forced to touch it. Finding it quite harmless, he examined it back and front, then through, shouting staccato remarks back to those on the bank. In the end, our guest had to be invited ashore, as ours was the first visit of Europeans to this locality since the removal of Tauparaupi and his friends, and the government escort on board was not at all sure it was safe to permit so great an interest in the missing villagers.

Working with natives can always be made easier by assistance from the government, as each village maintains a "head man," appointed by the District Officer, whose duties are similar to those of an alderman. He is generally chosen for his strong personality, and not infrequently is a former head-hunter or raider. As his word carries considerable weight in the village, it is well to present yourself to him with "papers" of authority or, better, to be introduced by a proper government officer.

Probably there are few places in the world, fiction to the contrary, where one may saunter more freely about, lightly plucking citizens for whatever use. Much of my early disappointment might have been avoided had I been aware of and observed certain ethical lumber in use in even the most remote localities, which in this country is referred to as "red tape."

The heads of northern Bouganville babies are bound almost immediately after birth. Lengths of strong fiber cloth are used, and the bands are tightened from time to time until the cranium has grown into the desired shape. The wrappings are then removed.

The hair of the boy children, which is allowed to grow long, is forced, during the initiation ceremony, into a hat similar to the one here shown on the older boy. This hat is worn during the several months involved in the rites, after which it is removed and burnt

BIG-BUKA BROTHERS

ARAUCARIAS ON A WIND-SWEPT KNOLL

CAMPING IN A PREHISTORIC FOREST

Araucarias, South American Trees that Trace Their Ancestry Back 200,000,000 Years Provide an Interesting Camp Site for an American Museum Expedition

By H. E. ANTHONY

Curator, Mammals of the World, American Museum

PHOTOGRAPHS BY THE OTTLEY-ANTHONY SOUTH AMERICAN EXPEDITION

The Ottley-Anthony South American Expedition, just recently returned from the field, traveled more than 20,000 miles and visited many sections of the southern continent. Notes regarding the purpose and accomplishments of the expedition appeared in NATURAL HISTORY *for September–October, 1929, page 533, and May–June, 1930, page 323. Of all their camps, from the Urubamba Valley of Peru to the pampa of Patagonia, the members of the expedition are agreed that the most interesting were the two in the Araucaria forests of Chile.*

The Araucaria is a coniferous tree, called a pine by South Americans, but only distantly related to the true pines. The tree, which took its name from the district of Arauco, Chile, is one of the few relicts of a type of forest formerly distributed throughout the world. Only about a dozen species exist today, which are confined to very restricted areas in Chile, Brazil, Australia, and a few of the Pacific islands to New Guinea. The fossil records show that forests of the Araucaria type probably existed in Palæozoic times and were widely distributed and comparatively abundant during the Mesozoic era. During the Jurassic, these trees flourished in what is now Great Britain, France, India, and southern Africa, among other localities. In the Cretaceous, they were growing in the Western Hemisphere from New Jersey and the Dakotas to Patagonia.

—THE EDITORS.

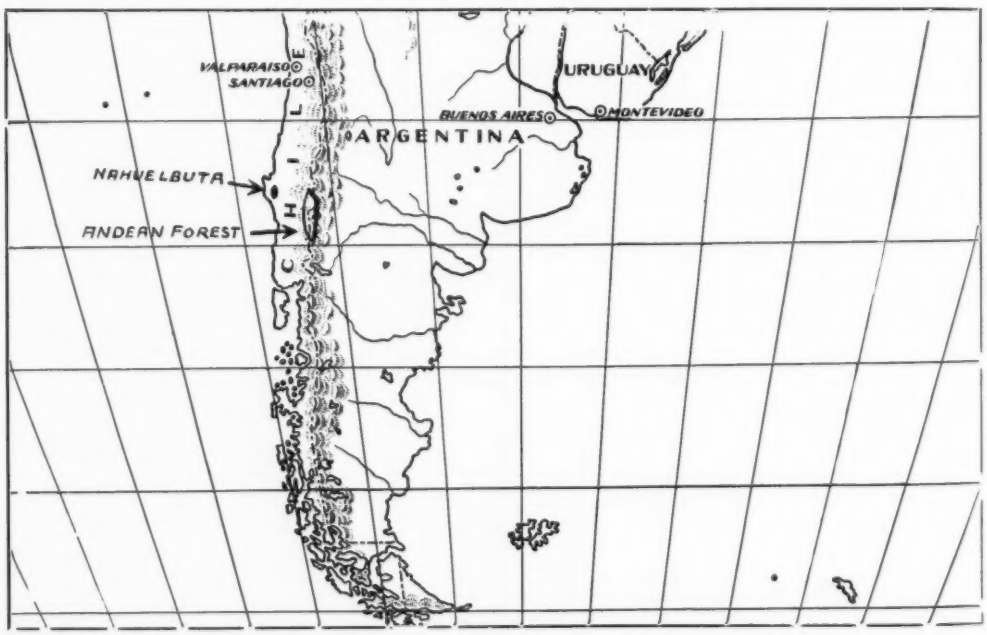
THE Chilean Araucaria (*Araucaria imbricata*) looks like something out of the past, at least to northern eyes. At a distance the fully grown trees appear to be large palms, with all the limbs confined to a crown carried on a straight columnar trunk. This is the species known to the nurseryman and florist as the monkey-puzzle. Before visiting Chile I had supposed that the feature which puzzled the monkey was the close arrangement of the limbs, a not

particularly disturbing tangle for an active animal like the monkey. Inquiry in the region where the trees grow provided another explanation. The monkey is puzzled because of the stiff, spiny character of the foliage which tips upward. The monkey might climb the tree without pricking itself, but would be in a quandary when descending against such an array of points. This foliage is stiff enough to pierce clothing and draw blood if one carelessly brushes against it.

The Araucaria forest in Chile is restricted to a small area in the Nahuelbuta range (a coast range), about 37° south latitude, and to a rather larger stand in the main cordillera of the Andes between 37° 30′ and 40° south, where it occurs in a narrow strip of little more than 100 kilometers wide and between the altitudes of 600 and 2000 meters above sea level. The expedition camped and collected mammals in both forests.

The Araucarias in the Nahuelbuta mountains were reached by way of Angol. At this little town we were the guests of Mr. Dillman S. Bullock, the manager of a large farm, where apples, peaches, cherries, and other temperate fruits flourish in company with figs, oranges, and similar tropical products. One day of travel from this valley, where snow is unknown, brought us into the mountains to the westward where the winter snows lie deep.

The road from Angol up into the mountains is not an automobile road as we understand the term in the States. It is traveled principally by ox carts and is deeply rutted and sidling in places. From the valley up over the first foothills, the road is bad, and from the summit on it becomes worse. Our truck, a Chevrolet, negotiated the first rises and some of the distance toward the second and last ridge, although it was temporarily hung up on high spots in the center of the road which caught on the axle or differential. Finally the road became so bad that we had to concede it would be



MAP SHOWING ARAUCARIA FORESTS IN CHILE

The two locations indicated by arrows were visited by the Ottley-Anthony Expedition

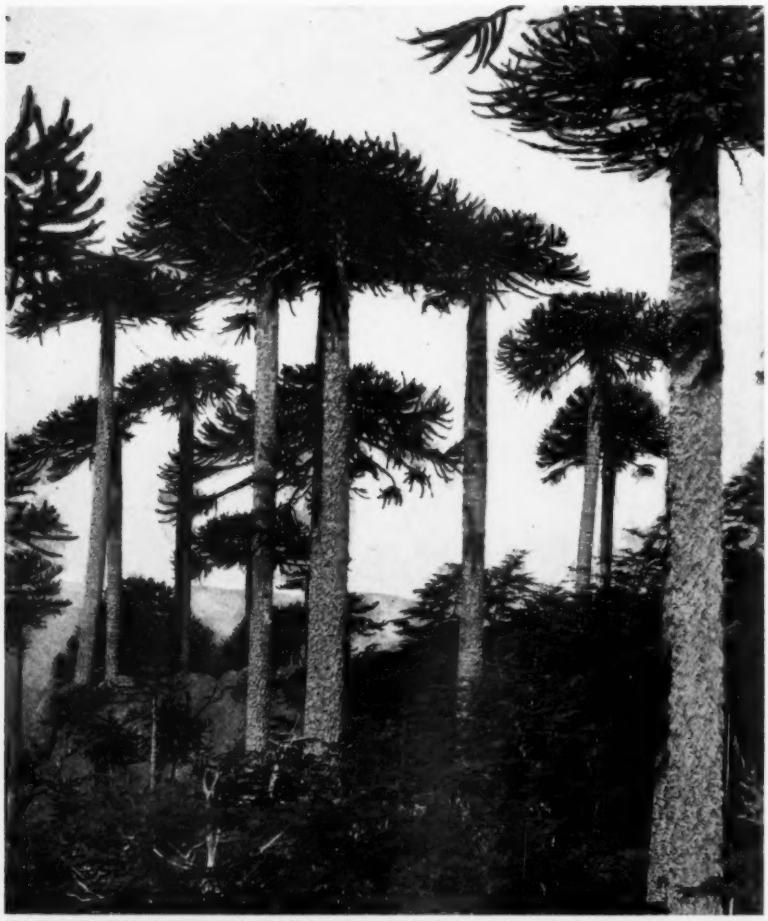
CAMP IN THE MAIN CORDILLERA OF THE ANDES
In the forest east of Curacautin. An ideal camp site was found in a forest of mixed Araucaria and beech

impossible to go farther with the truck, so we let the driver return to town after getting his promise to meet us at this place on our return trip a week later. We were fortunate enough to secure an ox cart for the rest of the distance, and, after divers delays, our equipment reached a camp site at 8:30 P.M. We had begun our move at 5:30 that morning.

Our tent was pitched in a small grove of Araucaria atop a low hill. There was considerable similarity to a pine forest in the vista of clean, rough-barked trunks, in the litter of needles underfoot, and in the noise of the wind through the tree-tops. But there was a vicious note to the soughing of the wind, a cutting quality to the rush of the air through the keen foliage overhead, that seemed more in keeping with the rugged character of the trees themselves. The Araucarias did not give pliantly to the breeze, like pines; their stiff foliage cut the wind and let it whistle past, and one might imagine that to these survivors of more strenuous epochs a little wind was nothing,—in the struggle for existence the species had seen millions of years of winds.

We set out traps and hunted for mammals, building up a collection to learn the faunal associations of the Araucaria forest. Large mammals are scarce. Mountain lions, or pumas, are said to occur there, and they seemed to be feared by the natives, but with little apparent cause, for we could not learn that the lions had ever hurt any people in the Nahuelbutas. Deer, the huemul of Chilean vernacular, are found along the ridges. We saw their tracks, but nothing of the animals themselves. Early in the forenoon, while we were hunting in a dark, quiet glade, we encountered a small fox that lives among the Araucarias. It saw us from a distance and slipped off among the trees as noiselessly as a shadow before we could raise our guns. Near the tent I surprised a fox at night, when I was hunting with a headlight. It returned with us to the Museum as a specimen.

Small mammals were also rather scarce, but in greater variety than the large species, and interesting because we were likely to encounter forms new to science in this little-worked patch of forest. The most interesting of the small species



ARAUCARIA FOREST

A scene along the upper ridges of the Nahuelbuta range. As the Araucaria reaches maturity the lower limbs usually die and drop off, leaving a clean, symmetrical trunk, with all the foliage concentrated in a compact crown

ARAUCARIA AND SOUTHERN BEECH

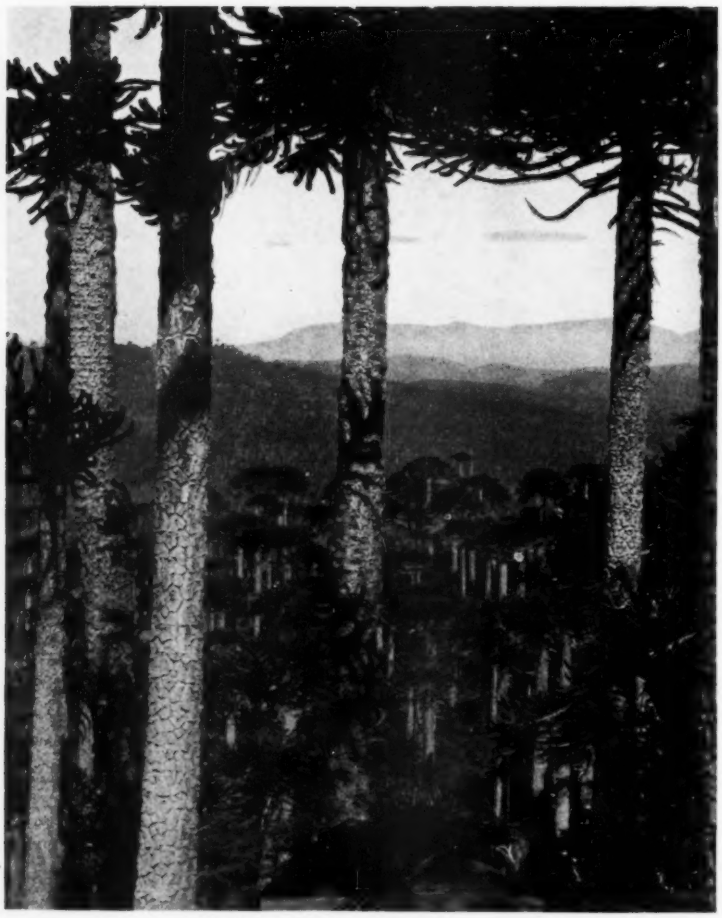
Various species of the southern beech, genus *Nothofagus*, are usually more or less closely mixed in with *Araucaria imbricata*. When the percentage of beech intermixture is very high, the forest is dark and the trees are draped with moss, for the beech with its luxuriant foliage cuts off most of the sun

ARAUCARIAS IN A CINDER PARK

The 'Araucaria forest" above Curacautin is cut up by extensive areas of volcanic ash, the loose cinders of which are almost entirely free of vegetation. These cinder parks have been formed by the activity of near-by volcanoes and seem to be of recent deposit

A MATURE ARAUCARIA

The bark of a fully grown Araucaria is very similar to that of a pine tree, being thick and deeply fissured. It is much harder than pine bark and is grayish outside, purplish red under the surface. This trunk measured twelve feet two inches in circumference at a height of five feet above the ground



OVERLOOKING THE ARAUCARIA FOREST IN THE NAHUELBUTAS

Although the summer in the Nahuelbuta range is warm and dry, there is plenty of snow in the winter. Cattle are pastured there during the clement months of the year, but when the snow comes, it lies so deep that the cattle and their herders must move down into the valleys

was a small burrowing rodent with habits similar to those of our pocket-gophers. It spends practically its entire existence under the surface of the earth in a series of underground burrows only rarely opening into a surface runway. This creature is especially wary and suspicious of traps, and only three were captured in the large number of traps set in their workings. A few bats were noted nightly, flying about openings in the forest. One that I shot proved to be nearly identical in appearance with the hoary bat of the United States; it is a member of the same genus, and made me feel almost at home when I looked at it. However, the time was early January and there were wild strawberries in the meadows, wild flowers were blooming in the clearings, and parrakeets were calling from the Araucarias; I was in the south temperate zone.

As we hoped to secure some food for camp by hunting, we had planned our provisions accordingly. Game was scarce and our only additions to camp fare were pigeons and parrakeets, and not many of those. We knew nothing of the psittacosis scare back in the States, the parrakeets were of good size, and we were short of meat. Parrots are a common article of diet in the South American back-country, and one never hears of psittacosis there. Perhaps the birds do not have this malady until they have associated with man and the benefits of his civilization.

The forest of the Nahuelbutas is not a pure stand of Araucaria. There is a large admixture of deciduous trees, mostly varieties of the southern beech, *Nothofagus*. These beeches are fine, large trees, with thick foliage, and are often draped with long streamers of gray Spanish moss. This forest seemed to be ideal for squirrels, but these animals do not occur in the

southern part of South America, for some reason not clearly understood. The Nahuelbutas are squirrelless, although the seeds of the Araucaria would be a favorable food supply. These seeds are large, much larger than those of any of our pines and are edible for humans. The Araucanian Indians in the past gathered them regularly when the cones ripened. The trunks of the Araucaria are rather too large to climb easily: one I measured near camp had a circumference of twelve feet two inches, at a height of five feet above the ground. The cone opens at maturity and the nuts fall to the ground.

Our limited time in the Nahuelbuta mountains came to a close all too quickly and we packed up for an early morning departure by ox cart. The cart had arrived at sundown the night before, much to our relief, for we dreaded the uncertainties of travel in this section and did not have too much confidence in our means of transport. Incidentally, we were using the last of our provisions, but the driver had brought eighteen eggs with him, another cause for welcome. That next morning four of us ate the eighteen eggs (some of us had five apiece, for we had not thought of scrambling them), and thus fortified by a breakfast of Easter-time proportions, we walked down to where we hoped to meet our truck, the lumbering ox cart bringing up the rear. The truck was not at the rendezvous, so we walked some more. After we had covered the greater part of the distance to Angol afoot, our truck driver met us with a small touring car and we were at least spared the humiliation of walking into town. The driver had considered the road too bad for a truck, although, when it came time to settle up, he expected and received (after much argument) the full price set for taking us all the way to the forest and back again. But this need cause no surprise to a South American

A YOUNG ARAUCARIA
The young Araucaria has a habit of growth very different from the adult tree. The limbs are evenly distributed from top to bottom in a rather stiff and formal fashion. The foliage is a bright green, and is thick with spiny tips

traveler, for, while the drivers there always hold the visitor strictly to his part of the bargain, they expect a very liberal interpretation of their own obligations.

The second visit to the Araucarias brought us into the main divide of the Andes east of Curacautin, Chile. We had traveled by train from Angol to Curacautin, and were more fortunate in our arrangements for transportation this time, needing only one day to secure a truck and an auto, a cook, and the provisions necessary for a brief camping trip. The road out of Curacautin is one of the main arteries of transportation leading into Argentina, and a railroad is projected to follow the same course. It is fair, as South American roads go. Were it not for the heavy dust and loose rock it might even be considered good. Automobiles pass regularly back and forth between Chile and Argentina, bands of sheep and cattle use the road, and we even passed an itinerant circus strung out along a quarter mile of the highway.

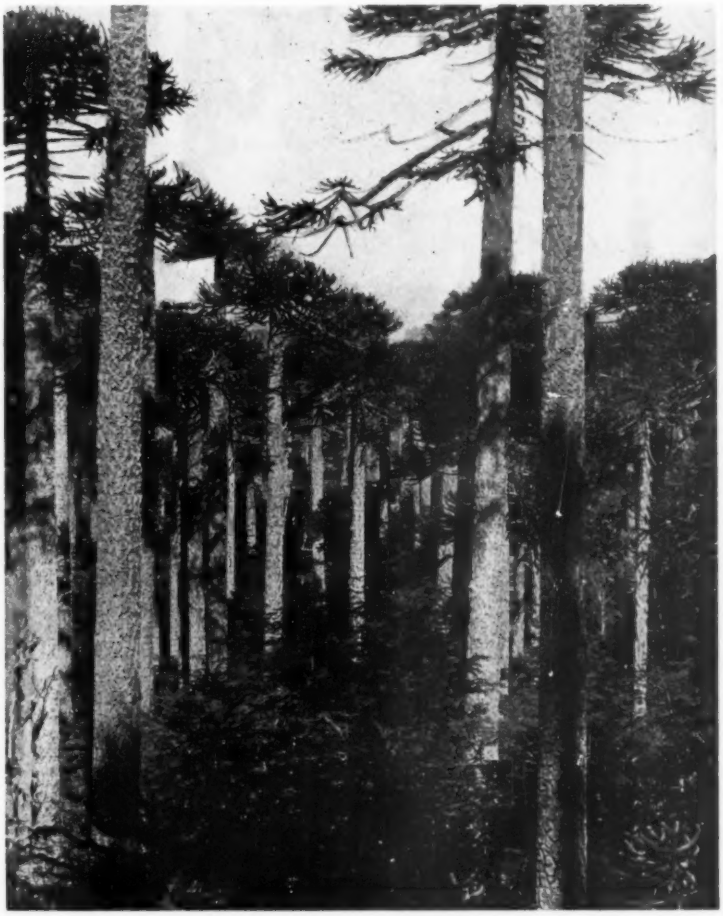
Our camp was situated just east of the main divide in a region almost exclusively forested by Araucaria. It was a beautiful spot, ideal for the collector, and had only one drawback. As soon as we stepped out of the auto to reconnoiter for a tent site, we were met by an enthusiastic delegation of large flies, called "tabanos" by the natives and similar in appearance to the horse-flies of North America. The "tabanos" buzzed about in clouds and alighted the instant one ceased slapping at them. People will tell you that the "tabano" does not bite, but that is a great mistake, for they live by sucking blood, and the insertion of the "tabano" proboscis is just as comfortable as that of a hot needle. A person is seldom bitten, because the approach

IN THE MAIN RANGE OF THE ANDES

The dormant volcano Tolhuaca is one of a group of snow-clad peaks overlooking the main Araucaria forest of Chile. Some of these peaks are active volcanoes and not only smoke but occasionally throw off great clouds of ash. Numerous hot springs are found in this region and are used as bathing and health resorts

of the fly is so noisy that one is not taken by surprise but slaps at it. Ceaseless attacks of these flies, however, wear on the nerves. During the summer months the "tabanos" are the greatest pests in all Chile. We had been bothered somewhat by them in our other camp, but now we were to learn how bad they really could be.

Several snow-clad volcanoes were in sight from the slope where our camp was situated. The most active of these, Llaema, erupted last in 1914 and poured out lava and clouds of ashes for several days. Volcanic ash lay in great parklike openings in the forest, and vegetation had not yet established itself there. Snow was still gathered in sheltered ravines on the higher slopes about camp, some of it probably lasting throughout the summer. These upper slopes were the home of numbers of colorful wild flowers, the most beautiful of which were lilies, either belonging to the genus *Hemerocallis*, our day lily, or closely related to it. We gathered bulbs of some of these and sent them back to the New York Botanical Garden where, if all goes well, they may become established and in time find their way into northern gardens.



A FINE STAND OF ARAUCARIA WEST OF ANGOL

The tall, straight trunk of the Araucaria makes splendid lumber and this tree is the most valuable timber in Chile. Because of the scarcity of large limbs, the Araucaria gives a very high yield per tree of merchantable lumber

The ground under the Araucarias is carpeted with a loose layer of rotting leaves, and in these several varieties of small rodents find congenial homes. Their burrows run along under fallen logs, and little piles of freshly excavated humus here and there attest to the activities of these mice. They are difficult to trap because their bodies and legs are so robust that they are usually able to pull out of the only traps small enough to set down in their runways. The largest of these mice, a species of *Notiomys*, has long fore-claws especially adapted for excavating in the deep soil, and its small eyes show that much of its existence is spent underground.

Here we encountered the "tucu-tucu," another rodent of habits similar to those of our pocket-gophers and resembling the burrowing rodent of Nahuelbuta. These were twice as large and threw out large "gopher hills" at the entrances to their tunnels. The burrows that are occupied are always well plugged with earth and opened only for brief intervals when the occupant slips out to forage at the very rim of the hole. Although the animal is so like our pocket-gopher in external appearance and in its mode of subterranean life, I noted one significant difference. The hind feet of this "tucu-tucu" are very broad, broader than the forefeet and better adapted as shovels for loose earth. The reverse is true of the pocket-gopher, which has the forefeet more highly specialized than the hind. With these he scoops out the earth and pushes it ahead, also using his chest. I suspected that this "tucu-tucu" kicked the soil out of its tunnel with the scooplike hind feet, and when excavating, backed out to the entrance tail first. The fact that two that we trapped were held tail first toward the entrance tended to confirm my observations. Whether the "tucu-tucu" has adopted this practice in order to be pointed for safety if attacked while digging, it would be difficult to establish, but since the habit is the reverse of what one would expect, it calls to mind the unusual way in which the African wart hog backs into a hole to escape from pursuing enemies. This is sometimes explained as a precaution against the likelihood that the hole may be already occupied by a hyæna or some other animal with which the hog has no great desire for intimate association. The story runs that the hog is all "set" for a prompt departure from the hole in question, but the real explanation may be an intention to enter the hole with his head and weapons toward the enemy that is following.

The European hare, which has been introduced into Argentina, has within the last few years spread westward across the Andes and into Chile. We saw this hare in the Araucaria forest, an unlikely place for such an animal and illustrating its adaptibility to conditions as it finds them. It was the commonest mammal that one might expect to see, and during a walk along the road at dusk we were certain of encountering several. As there are no hares or rabbits native to this section of South America, the introduced hare, with no competition and few enemies, will spread so rapidly that it will very shortly become a serious pest for the farmer and sheep raiser of Chile.

With a feeling of real regret that we lived so far away from such a delightful region, Mr. Ottley and I departed from this camp in the bracing atmosphere of a mountain morning. We motored back to Curacautin through the tall forest of Araucaria and spreading beech, past the clear, swift-flowing waters of the Rio Cautin, a salmon-fisherman's paradise, and arrived at the railroad in plenty of time for the afternoon train. We both wished to believe that we might return again some day to this stronghold of ancient forests.

© E. M. Newman from Publishers Photo Service

The gate of Itsukushima Temple at high tide

SHINTO—THE WAY OF THE GODS

The Ancient Cult of the Islands of Japan—Eight Million Celestial and Terrestrial Gods and the Thousands of Temples Dedicated to Their Worship

By S. ICHIKAWA

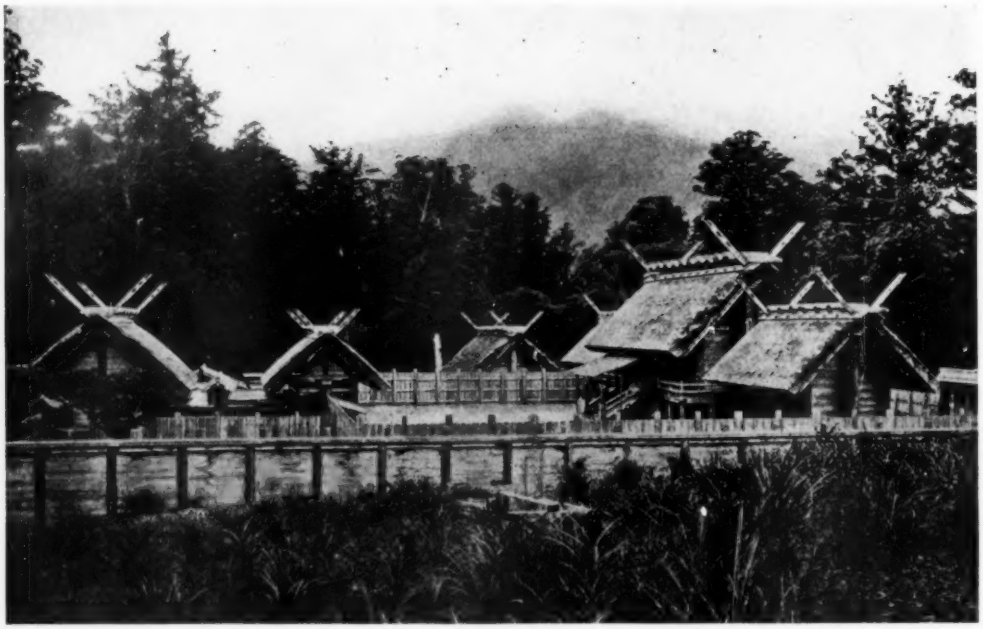
Department of Anthropology, American Museum

IT has often been said that Japan is a "Land of Gods," for from remote times uncountable gods have been a part of the beliefs of the Japanese. When visitors to Japan are taken to any of the numerous beauty spots of the islands, they invariably find close at hand the dwelling places of some of these gods—Shinto gods—for in an effort to please their Shinto deities the Japanese have long made it a practice to erect temples in almost every place of beauty.

These Shinto temples have gateways of a type peculiar to them alone, and everyone familiar with Japan is equally familiar with the "torii" whose graceful lines impart added beauty to the scene. They differ radically from the gates of the Buddhistic temples, and though their design is immutable, its origin is not definitely known.

The visitor to one of these shrines often hears the strange, songlike prayer of a Shinto priest, accompanied by the impressive and echoing sound of a throbbing drum. Such sounds, issuing from these ancient shrines, and drifting through the age-old pines and cypresses that are so often a part of the setting, constitute one of the oustanding characteristics of old Japan.

The "Norito," or text of these prayers, is of unknown antiquity. The prayers themselves are addressed to individual gods, or to the gods in general, and every day they are repeated. Now and then the

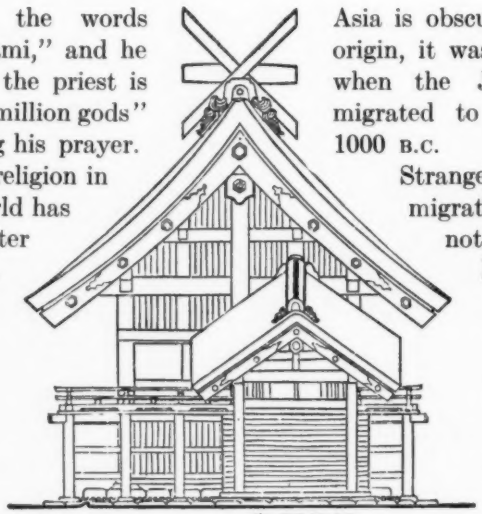


GEKU, THE TEMPLE OF ISE

One of the oldest temples in Japan, constructed between 457 and 479 A.D., and dedicated to the earliest gods. It is the sister temple of Nai-gu, where the sun-goddess is enshrined

visitor may catch the words "Yao Yorozu no Kami," and he will realize then that the priest is calling on the "eight million gods" to whom he is offering his prayer.

Probably no other religion in the history of the world has conceived of a greater congregation of gods. Probably no other people has ever imagined a gathering of deities approaching so closely the number of the worshippers themselves. Realizing this unique fact, one naturally asks why so great a number were ever conceived.



OH-YASHIRO STYLE ROOF CONSTRUCTION

Although this structure has been modified in recent times, it still retains the main characteristics of the most ancient form, which is shown in the picture above. It is known as the Oh-yashiro style, the origin of which is unknown

Shinto is the ancient cult of the islands of Japan. Its origin on the mainland of Asia is obscure, but, whatever its origin, it was brought to Japan when the Japanese themselves migrated to the islands about 1000 B.C.

Strangely enough, these early migrating Japanese were not very primitive. They had a fair degree of civilization. They were an agricultural people. Already they were using implements made of iron. With a people so well advanced in the arts, it was natural that their religion, too, should be advanced. The name "Shinto," however, was not then applied to it. It was not until Buddhism was introduced to Japan (552 A.D.)

that the name originated, and then it was adopted in order to differentiate the older religion from the new Buddhism, or "Butsu-do."

Originating so long ago, it is natural that there should be different opinions among both Japanese and European scholars as to the origin and nature of early Shinto. One says it is pure Nature worship. Another contends that it is ancestor worship. As a matter of fact, these schools of thought are based on ancient quasi-historical works. One of these is called "Kojiki," while the other is known as "Nihongi."

These two old chronicles are the earliest written records of Japan. Kojiki was published in 712 A.D. Nihongi followed eight years later. Both give much the same account, the second being somewhat in the nature of a revised and official version of the first. In these two somewhat detailed accounts the gods mentioned are principally such deities as are usually found in well-developed religions devoted to Nature worship. There are, however, some that are definitely of the other category—gods that have originated from among the heroic ancestors of the people who ultimately deified them. It is from that side of Shinto, however, that is the more closely associated with Nature worship, that the greatest number of deities has come.

In order definitely to answer this question the student must delve deeply into the archæology and ethnology not merely of Japan but also of all those near-by countries and islands which, in the last several thousand years have had any influence on Japanese religious thought—Korea, China, Siberia, and Oceania. To

© *by E. M. Newman from Publishers Photo Service*

THE ENTRANCE GATE OF ISE TEMPLE

This wooden "torii" is an example of the original form, and is extremely simple in structure. Much more intricate and complicated styles were later developed

Photograph by Roy Chapman Andrews

MAUSOLEUM OF IEYASU

A view of the second court, looking toward the steps leading to the main temple. The torii at this shrine is of bronze

Photograph by B. M. DeCou

THE YOMEI GATE OF NIKKO SHRINE

The carvings on this inner gate are so elaborate that an observer can spend a whole day studying them without realizing the passing of the hours. It has been named the "Sunrise to Dark Gate" on this account

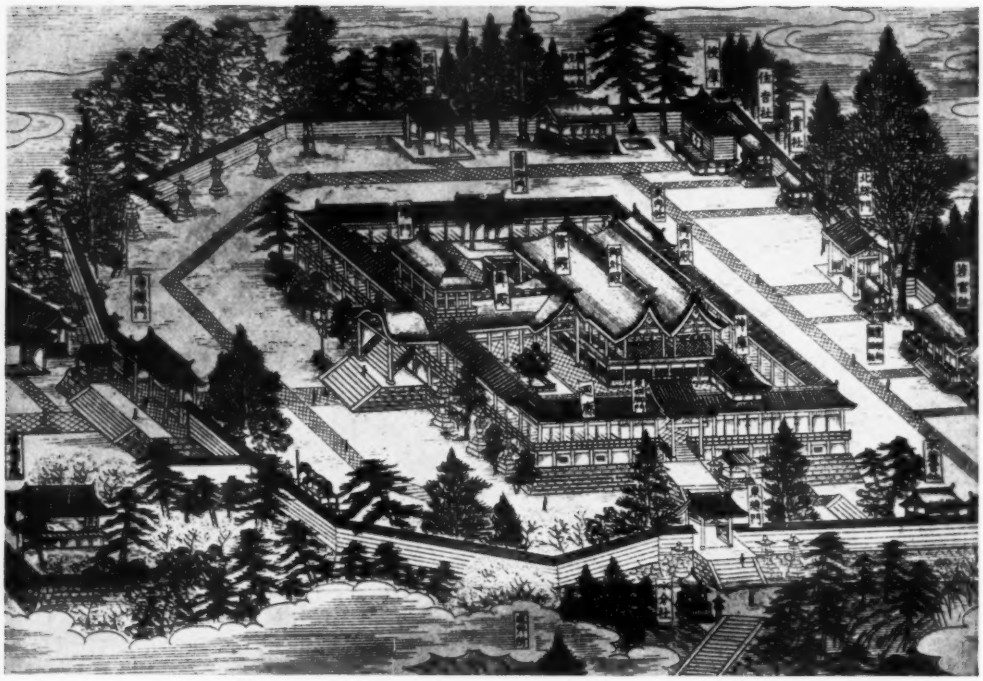
THE IZUMO TEMPLE, IZUMO PROVINCE

The deity of this temple is Oh-kuninushi-no Mikoto. It is the oldest temple in Japan, and is second in importance to the temples at Ise

© by E. M. Newman from Publishers Photo Service

THE SHINTO TEMPLE KASUGA

The stone lamps which line the walks of this temple have been brought by worshippers wishing to pay homage to a deity. Altogether about 1800 such lamps have accumulated in the gardens of this shrine



A BIRD'S-EYE VIEW OF OTOKOYAMA HACHIMANGU

Showing the structure and arrangement of the shrine at Kyoto. This is one of the more elaborate types

NINIGI-NO-MIKOTO

A Japanese artist's conception of one of the five principal terrestrial gods. This picture and those of the gods and goddesses on the following pages were taken from an old Japanese text book

be thorough, the investigation might also be carried to the Indians of the northwest coast of North America.

Already we know of a definite connection between the Shinto and the old Korean religion, where still are to be found deities similar to some of the Shinto gods.

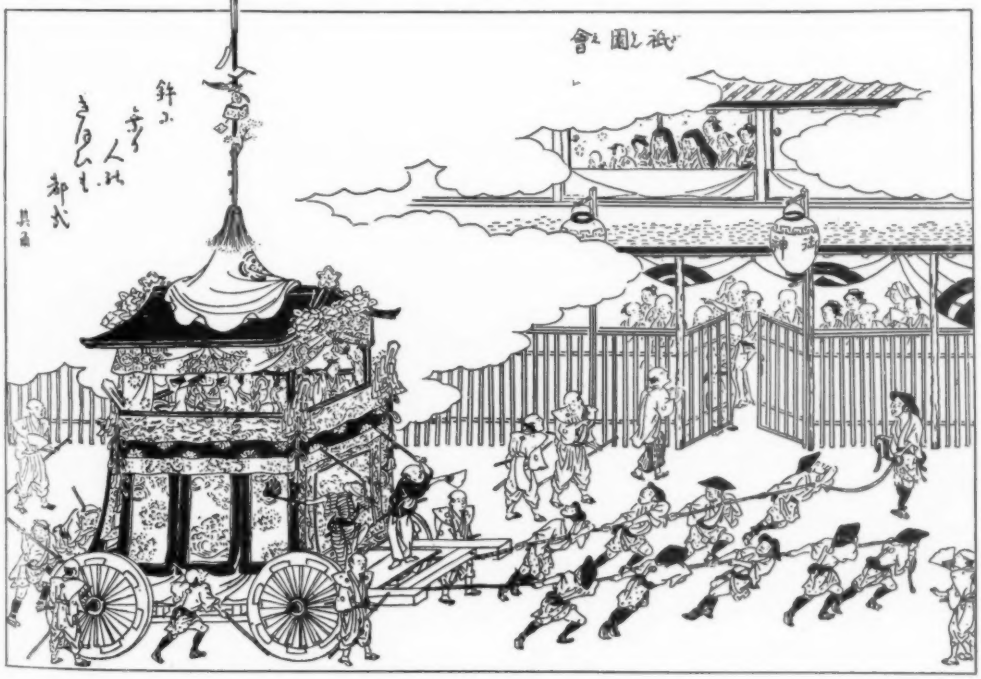
The earliest of the Shinto gods to appear in the ancient records are somewhat celestial in character. The Japanese name for "god" is "Kami," meaning "above" — obviously suggesting the celestial idea. There are, however, many terrestrial gods, which are almost more material than spiritual. They are only vaguely personified and are not at all to be likened to ghosts or spirits. The Sun Goddess, for instance—Ama-terasu Ohmikami—the ruler of the world, is visualized as occupying a place somewhere in the heavens. The name itself suggests this, for it can be translated

"Great Heaven-illuminating Goddess." Of the terrestrial gods, many are visualized as guardians of forests, streams, and many other natural spots. As closely related to the worshippers as to the more powerful celestial gods, these lesser deities might be compared to the sylvan gods of forest and stream as visualized by the ancient Greeks.

Spiritualistic conceptions were not well defined in early Shintoism, but in its development such conceptions came to have a part, which was much influenced by the introduction of Chinese culture. It was during this stage of development that departed heroes came to occupy an important place among the gods, and ultimately all those who died were imagined as becoming gods of greater or lesser degree. Thus ancestor worship came to be firmly and widely established.

AMA-TERASU OH-MIKAMI
The sun-goddess, another of the five principal terrestrial gods

The old Japanese term for the governing people is "Matsuri-goto," which signifies, literally, "matter of worship." Thus the chief priest of Shinto is



GION FESTIVAL AT KYOTO
From an old Japanese print
One of the old-style "band wagons" is being drawn through the street in celebration of festival day

HIKOHO-HODEMI-NO-MIKOTO, ONE OF THE FIVE PRINCIPAL TERRESTRIAL GODS

MASAKA-MAKATSU-KACHIHAYABI-AME-NO-OSHIOMIMI-NO-MIKOTO, A TERRESTRIAL GOD

logically the emperor himself, as he is the chief representative of the original Japanese tribe.

From these facts it will be seen that there are three separate conceptions of gods; firstly, Nature as a god; secondly, anthropomorphic beings as gods; thirdly, spiritual emanations as gods. In addition to this the Japanese once conceived of the emperor as being a god, as the ancient Egyptians conceived their pharaohs to be. Today, however, the emperor is accepted rather as a sacred human being, though deceased emperors naturally occupy positions of importance among the gods.

There are, of course, thousands of Shinto temples to be found in Japan, but

CELESTIAL GOD AND GODDESS, IZANAGI AND IZANAMI, WHO ARE SUPPOSED TO HAVE CREATED JAPANESE ISLANDS

of them all the Ise shrine is the most sacred. It belongs directly to the imperial family, and is one of the oldest in the islands. Erected in the province of Ise about the beginning of the Christian era, it is still faithfully worshipped by *thousands*. The Izumo temple, which is much older, ranks next in importance to Ise. The deity of the former temple is Ama-terasu Ohmikami, the sun goddess, who is the ancestor of the emperor. The deity of the latter temple is Oh-kuninushi no Mikoto, who is the ancestor of the pioneer Japanese tribe that migrated to the north shore of the southern part of Hondo from the Asiatic mainland, passing through Korea and crossing

the Sea of Japan, while the main body crossed the channel separating Korea and Japan and settled on Kyushu Island a little later in history.

From this very island the first emperor, Jin-mu, started the expedition that conquered Japan. He is deified, and his temple was erected in the province of Yamato after his death. Today it is one of the most important of Japanese shrines.

In many of the thousands of lesser temples are to be found deities which have become in part Buddhistic. This has been the result of an amalgamation of the two religions by Gyoki, the famous Buddhist priest who lived in the Eighth Century, and established a new sect called "Ryobu-Shinto."

But whether the temples are pure Shinto or whether Buddhist influences have crept in, all have periodic festivals, generally in the flowery spring or the fruitful autumn, and pilgrimages of great numbers of devout people are a common characteristic of Japanese life. At such times of festival one can recognize among the customs of the people many that reveal strange mixtures of Chinese, Korean, and sometimes even Oceanic ideas and conceptions. At the important temples stages are erected for an old traditional pantomime dance called "Kagura," which commemorates incidents of an ancient and mythical narrative.

THE FIRST JAPANESE EMPEROR, JIN-MU. REPRODUCTIONS OF THIS FIGURE ARE GIVEN TO WORSHIPPERS AT THE KASHIWABARA TEMPLE

To discuss the theological conceptions of Shintoism is instantly to plunge into a vast and complex subject, far too enormous for consideration in so small a space as that at my disposal. There is, however, this that can be said. The Shinto faith, while it may or may not be as strong as it has been in the past, is still an enormous power throughout Japan. But in its intermixture with Buddhism,

KUNITOKOTACHI-NO-KAMI, THE FIRST KNOWN CELESTIAL GOD

TSUNUGUI AND IMOIKUGUI-NO-KAMI, MALE AND FEMALE CELESTIAL DEITIES

Photograph by B. M. DeCou

THE SACRED BRIDGE

This handsome red lacquer structure, located at Nikko, Japan, is dedicated to the gods, and is known as "The Sacred Bridge"

© by E. M. Newman from Publishers Photo Service

THE PROCESSION OF THE AOI FESTIVAL

This festival, which is held every April, is a famous and ancient custom. As part of the festivities there is a horse race in which twelve horses are ridden by Shinto priests

© by E. M. Newman from Publishers Photo Service

ITSUKUSHIMA TEMPLE

During festival times, lanterns are hung about the temple, their reflection on the water giving added color and beauty to the scene

© by E. M. Newman from Publishers Photo Service

THE ENTRANCE TO THE OSUWA TEMPLE

These gateways show the stone structure which is more common than either wood or bronze. This shrine is better known to foreigners as "The Bronze Horse Temple"

many of the simple country folk believe fervently that this earth is guarded by Shinto gods, though they accept as fact the belief that the future world is ruled and guarded by the Buddhas. Thus more Buddhistic deities may still be added to the infinite variety of Shinto gods, for the conception of gods of infinite numbers still appeals strongly to the sturdy people of Japan.

Diverse religions are in this way firmly established in Japan, and many beliefs find expression among the Japanese. Yet, despite these differences, any national calamity or problem of major proportions, such as war, instantly draws the entire nation into a compact and patriotic unit, headed by the emperor and fervently supported by every stratum of society, by every sect and religion. Thus, because the emperor is also the chief priest of Shintoism, Japan, at times of stress, can be said to be all but universally Shinto, with divergences of religious opinion buried for the time being in the all-pervading influence of Shinto. With its strangely powerful adaptability and power of absorption of other ideas, Shintoism remains supreme, not by opposition to other conceptions and other beliefs, but by its ability to take to itself whatever of good and of power these others have to offer. Thus, Shintoism seems still to be the single universal religion in a land where many religions are practiced daily.

© by E. M. Newman from Publishers Photo Service

A PAGODA AND A TORII

In the temple grounds at Nikko stands this pagoda, considered the finest in Japan, and the most peculiar in construction. It has an immense central pole, about 100 feet long, that is suspended, from the top and swings within twelve inches of the ground. The action of this pole makes the tower practically immune to the slight earthquake shocks that sometimes occur in the vicinity of Nikko

A Young "Giant Electric Bug" in a Home Aquarium

AQUATIC INSECT PETS

How to Make and Maintain an Insect Aquarium at Home for Instruction and Amusement

By FRANK E. LUTZ
Curator, Department of Insect Life, American Museum

IN the preceding issue of NATURAL HISTORY some features of the case-making instincts of young caddis-flies were described. Even when one does not tamper with the natural behavior of these aquatic creatures, they are fascinating to watch, and are among the easiest of insects to keep in small aquaria. However, they are by no means the only aquatic insects that amply repay the very small amount of trouble and expense required to have them as pets. Please let the fact that for many years our home has never been without at least one bowl of gold-fish free me from any suspicion of narrow-mindedness when I urge that, as is shown even by the initial syllables of the words, insects are more interesting, instructive, and inexpensive.

Miall's classic *Aquatic Insects* and many other books have been written on this subject and the half has not yet been told. Let us start first with methods and then go as far as the editor permits.

Lowell truly said that there is no leaf nor blade too mean to be some happy creature's palace. In the same sense a fruit jar or a drinking glass may contain the universe of an insect; and such household objects are all that we really need for equipment. But, if you wish something that will look rather better on the living-room mantel, you might use a type of small aquarium which we have recently devised for that purpose. As it is not patented, you may make it yourself if you can.

The sides and bottom are one piece of plaster of Paris impregnated with bee's wax. The front and back are glass plates. Being a frugal soul and having a supply of spoiled 4×5 photographic plates, I clean and use them for the glass. They are clearer than window glass. The glasses should be not much, if any, more than an inch apart, because you will wish to watch some of your pets through a magnifying lens.

In order to cast the plaster sides and bottom you will need a mold. The most difficult part of the mold to make is that which represents the inside of the finished

"BACK-SWIMMERS"
When these aquatic insects stand with their feet on the ground, they resemble overturned boats, but as they swim on their backs the "boats" are then right side up

aquarium. It can be modeled in clay ("plasteline," "plastecine," etc.) but then it will have to be remodeled each time that it is used. An easier way is to make first a clay model of the sides and bottom of the finished aquarium, put on the glass front and back, and then pour plaster in the middle. When the plaster is set, take the things apart and with a knife do any trimming that may be necessary of the plaster block which will be the inside part of the mold used in casting the actual aquaria. Shellac this mold and it may be used many times. Its sides and top (what will be the bottom of the inside of the aquarium) should slightly slope toward what will be the front. This slope will not only be pleasing in the finished product but it will make it easier to get the center mold out of the cast sides and bottom.

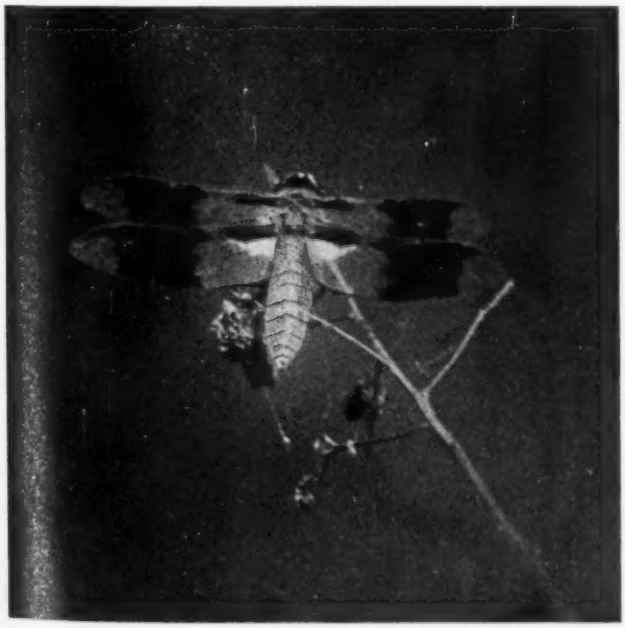
The rest of the mold may be made either with glass plates or with plaster. Since the glass plates are simpler for the inexperienced and since the experienced will need no instruction about making plaster molds, I shall explain the use of glass plates. Lay one piece of glass flat down on a table. Set on this the inside mold which you have made. It should be upside down; that is, what will be the open top of the aquarium is now resting on the horizontal piece of glass. Place the glasses which you are going to use for the front and back in position against this mold and fasten them there either with a clamp or by placing a lump of clay against the outside. Next place a piece of glass against each side to complete the mold. Fasten these in place either with clamps, rubber bands, or string. Seal all edges, including those at the bottom with clay pressed against the outside. Now pour into this mold freshly mixed plaster, filling the mold to its top (what will be the bottom of the aquarium). The dry

THE DAMSEL-FLIES, WHEN AT REST, HOLD THEIR WINGS VERTICALLY OVER THEIR BODIES

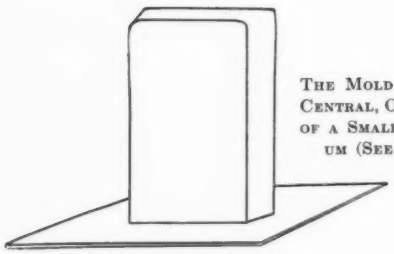
plaster should have been mixed with water to the consistency of real cream and, after mixing, you will have to move quickly or it will set before you can pour it. Let the plaster in the mold harden for at least half an hour before taking it out. You will find that the pieces of glass can easily be separated from the plaster. If any plaster has run between the central mold and the glasses (due to the fact that the front and back glasses did not fit tightly against the central mold) scrape it off carefully before trying to push out the central mold.

All of this may seem very complicated, but the accompanying figures will help some and experience will do the rest. By the way, the plaster central mold should be greased lightly with vaselene, lard, or something of that sort. The pieces of glass need not be greased if they are clean.

Having the plaster sides and bottom of your aquarium all in one piece, let it dry thoroughly for several days and then soak it in melted bee's wax for fifteen minutes or so. The wax may be kept melted in a double boiler or its equivalent. After taking the plaster out of the wax and allowing it to cool, brush more wax on the surfaces which will be in contact with the front and back glasses, making a fairly even layer about a sixteenth of an inch thick. Now, heat the glass plates in an oven. Let them get quite uncomfortably hot to handle with bare hands and then press them, one at a time, in place on the wax-coated plaster. They will melt the wax and, on cooling, will be firmly

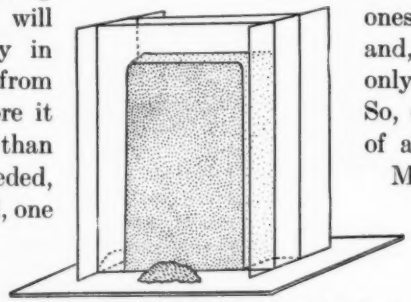


THE TRUE DRAGON-FLIES HOLD THEIR WINGS OUT FLAT AT THEIR SIDES



THE MOLD FOR THE CENTRAL, OPEN PART OF A SMALL AQUARIUM (SEE TEXT)

cemented by it to the plaster which is waterproofed by the soaking in wax. Perhaps there are bubbles of air between the glass and the plaster. If not too large, these will do no harm unless they reach to the inside of the aquarium. If they do, take the glass off by heating it and try again. You will doubtless find difficulty in keeping the hot glass from sliding on the wax before it cools. Nothing more than patience is really needed, but little blocks of wood, one placed at the middle of each side, will conserve your supply of patience. A strip of surgeon's adhesive tape should be put on the outside of the sides and bottom, folding over a bit on the front and back. As a sort of finishing touch, this tape, after being put in place, may be given several coats of a waterproof varnish, any color you wish.



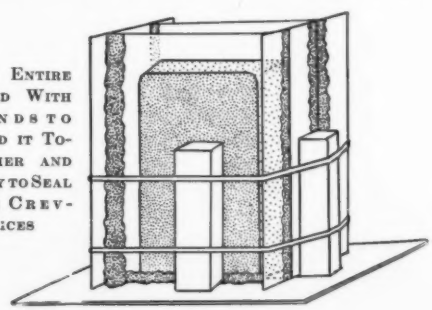
THE CENTRAL MOLD SURROUNDED BY GLASS PLATES TO FORM THE SIDES

To warn the ingenious, I ought to say that we have experimented with various substitutes, such as liquid celluloid, tar, and varnish, for the wax, but found that they are not so good. However, do not let this warning deter you from experimenting and, above all, do not let the description of this aquarium make you forget that finger bowls, soup dishes, fruit jars, photographic developing trays, and the like are very satisfactory aquaria for insects.

Those who have kept goldfish will at once think about "balancing" their aquaria with plants or about using some other device to keep plenty of air in the water. This is important for fish and for many aquatic insects. On the other hand, it is of less importance in the case of the many kinds of aquatic insects, including mosquito larvæ, that normally come to the surface for air.

Keep mosquito larvæ in our homes? It does seem to be a queer notion; but they are both interesting themselves and they make good food for other interesting creatures. We are so used to thinking of insects as pests that we find it difficult to think of using them as pets. Furthermore, it is only the grown-up mosquitoes that bite and, of the grown-up ones, it is only certain species and, of those species, it is only the females that bite. So, do not think too harshly of all mosquitoes, even.

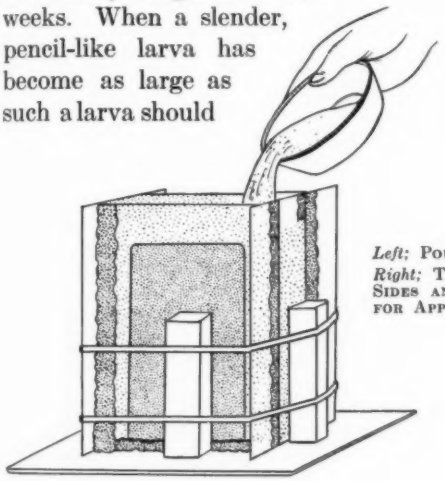
Mosquito larvæ are easy to feed because they eat the microscopic plant-life that is in the "silt" at the bottom of natural pools. Put a pinch of such débris in the aquarium and Nature will do the rest. These larvæ, "wrigglers," actively move about by twists and jerks and, as for the species you are likely to have, frequently come to the surface for a breath of air. Curiously enough, they get this air through a tube at the hind end of their body. While at the surface, members of the genus *Anopheles* lie practically level but, as a rule, the larvæ



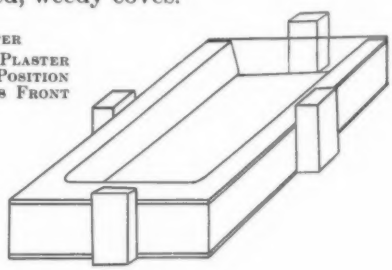
THE ENTIRE MOLD WITH BANDS TO HOLD IT TOGETHER AND CLAY TO SEAL THE CREVICES

of other genera hang with the head well below the surface.

One advantage of young mosquitoes as occasional inhabitants of home aquaria is that they may pass through all of their life-history stages in a few weeks. When a slender, pencil-like larva has become as large as such a larva should



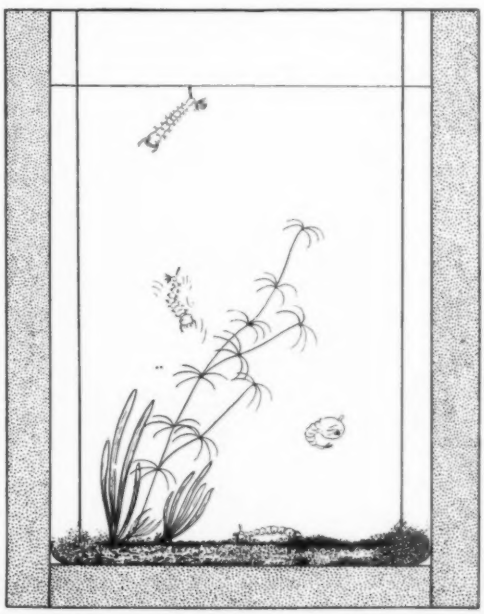
Left; POURING THE PLASTER
Right; THE FINISHED PLASTER SIDES AND BOTTOM IN POSITION FOR APPLYING THE GLASS FRONT AND BACK



be, it splits down its back and comes out of its old skin a grotesque but active pupa looking as though it might be an aquatic gnome. It has on its humped back a pair of funnel-shaped tubes and it is through these, instead of through a tube on its tail, that it now breathes. Usually not more than a few days later this, too, splits down the back, and then is when you will want to be watching it in order to see the marvelous transformation for which insects are so noted. Out of this under-water gnome steps one of the daintiest of aërial creatures. By the way, have you ever seen a male mosquito? Possibly not and this may be your chance. The male differs from the female in more ways than merely not biting. And, how does the adult mosquito breathe? Not through its mouth.

An easy way to get live things for these small aquaria is to sweep an insect net through the vegetation and among the bottom débris of natural pools or ponds. Often a small pool yields better results than a large pond. Lakes are usually not much good for this purpose except in sheltered, weedy coves.

Such a sweep of the net is quite likely to gather in at least one dragon-fly larva, as great an enemy of mosquito larvæ as the adult dragon-fly is of adult mosquitoes. Now, the order of dragon-flies, Odonata, consists of two suborders: damsel-flies and the true dragon-flies. In the adult stage these may be distinguished by the fact that the damsel-flies when at rest hold their wings vertically over their bodies but the true dragon-flies hold theirs out flat at their sides. In the larval stage there is a more striking difference, for a damsel-fly larva has three,



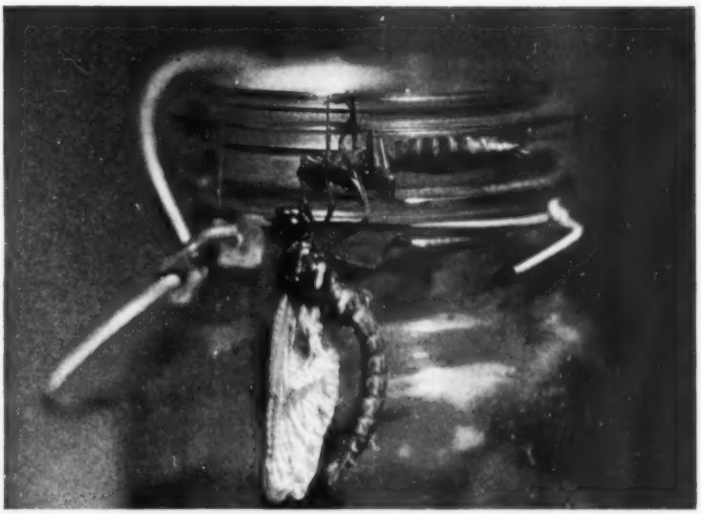
A WAX-IMPREGNATED PLASTER AQUARIUM STOCKED WITH MOSQUITO LARVÆ AND A MOSQUITO PUPA

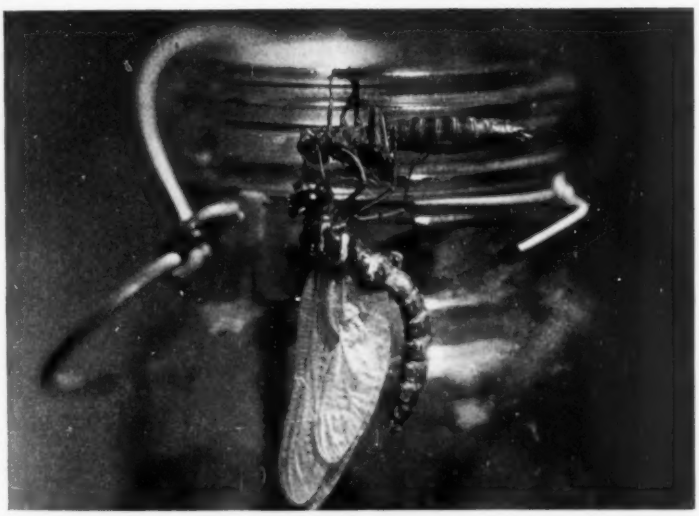
AN ADULT DRAG-ON-FLY COMING OUT ITS NYMPHAL SKIN

ALL OUT, AND IN POSITION FOR EXPANDING ITS WINGS

THE WINGS ARE NOW ABOUT HALF EXPANDED

HERE THE WINGS ARE NEARLY COMPLETELY EXPANDED



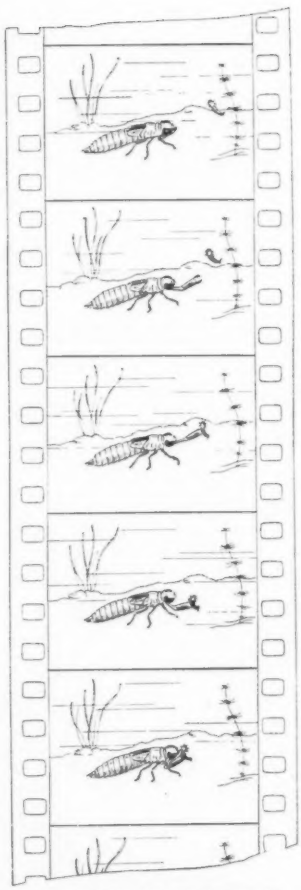


NOW THAT THE WINGS ARE EXPANDED, THEY NEED TO DRY

THE WINGS HAVE DRIED AND ARE READY FOR THE FIRST FLIGHT

often rather pretty, finlike gills at the hind end of its body. These gills take up dissolved air from the water and pass it through fine tubes to the body. A true dragon-fly larva has no such external gills but is continually sucking water into and expelling it from the hind part of its abdomen. Dissolved air passes through the rectal walls and is then carried by fine tubes to the rest of the body. When this water is expelled forcibly, the dragon-fly larva is shot forward by the back-pressure.

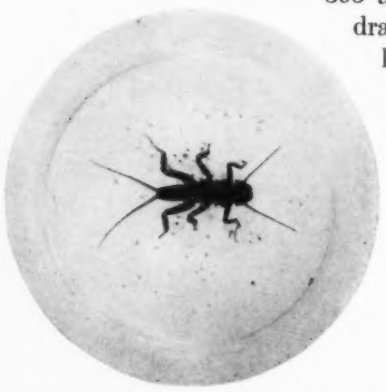
The larvæ of both dragon-flies and damsel-flies have a most curious method of catching their prey, other small aquatic creatures. I have tried to illustrate this by the drawings of two imaginary motion-picture films. The larva's highly specialized lower lip is jointed somewhat like the boy's arm and has at the end a pair of finger-like pincers. When wishing to catch something with these pincers, the larva suddenly extends its lip and is usually successful. Then it folds its lip up again and the grasped prey is automatically brought to the larva's mouth for the next part of the action.



IMAGINARY MOTION—
The dragon-fly larva catches its prey with the finger-like pincers at the end of its jointed lower lip

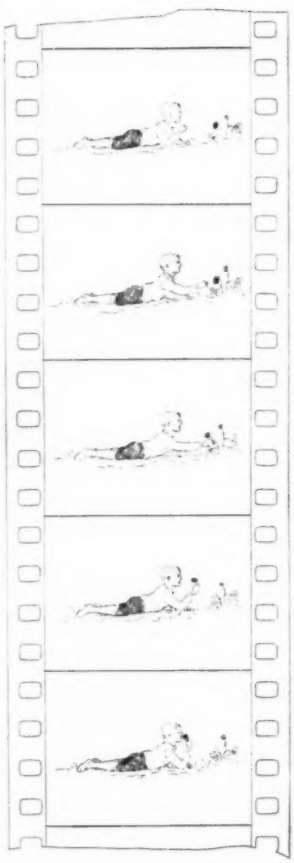
Unlike the mosquito, butterflies, beetles, and so on, but like true bugs, grasshoppers and many other insects, the dragon-fly has no real pupal stage in its life history. You will notice that larvæ which are nearly or quite full-grown have four pads on the back of the thorax. These contain the wings of the adult folded much as is a parachute strapped on the back of an aviator ready for a jump. When the proper time comes, such larvæ crawl out of the water (furnish your aquaria with a projecting stick which they can use), split down the back, unfold their wings, and fly away. The pictures on pages 394 and 395 are part of a series taken of a becoming-adult dragon-fly that had lived in a fruit-jar aquarium and had its coming-out party on the edge of the jar.

Speaking of "true bugs," there are a number



(*Above*) Larva of a stone fly. Among its distinguished characteristics are the *two* "tail filaments," and the gills at the bases of the legs

(*Right*) This "water scorpion," which is not a scorpion at all but a true bug, breathes atmospheric air through a tube at the hind end of its body



—PICTURE FILMS
The boy reaches for a berry with his fingers in much the same way that the dragon-fly uses its pincers

of lively ones for these home aquaria. True bugs are insects belonging to the order Hemiptera, suborder Heteroptera. Leaving other characters out of account and confining ourselves to aquatic insects, we may say that they are the only ones which have neither pupal stage nor chewing mouth-parts. Their mouth is a sucking beak and what they suck most of all is the body-fluid of other aquatic insects.

Of these aquatic true bugs, I prefer the lively "back-swimmers" and the equally lively "boatmen." If you wish more striking things, you will want one or two of the huge "electric-light bugs" or the grotesque "water scorpion," which is, of course, not a scorpion at all and is perfectly harmless so far as we are concerned.

If there is anything in Nature that is more like a submarine being propelled by oars than is one of those "boatmen," it probably is a "back-swimmer." As a matter of fact, these two groups of insects are closely related families, the former being Corixidæ and the latter Notonectidæ. When a Notonectid is what we might call right side up, that is, with its feet on the ground, it is shaped like an overturned boat but it swims upside down so that the boat is then in the right position. Why these things should be so is a difficult thing to explain and there may be no reason. The fact that the back of a back-swimmer is pearly-white while its ventral side is dark has been explained by pointing out that, when swimming upside down, the dark color of the ventral side will blend with the dark pond-bottom and the white will blend with sky-light, but that may not be the reason.

Variety might be given as a distinctive characteristic of insect life. Beetles, flies, moths, wasps, and other true bugs each have aquatic representatives. "Orders," such as caddis-flies, May-flies and dragon-flies, are considered distinctly aquatic because

(*Left*) A caddis-fly larva was dispossessed of its "log-cabin" case and the case was taken entirely apart. At 10:30 A. M. the larva and a supply of pieces were put in a small aquarium

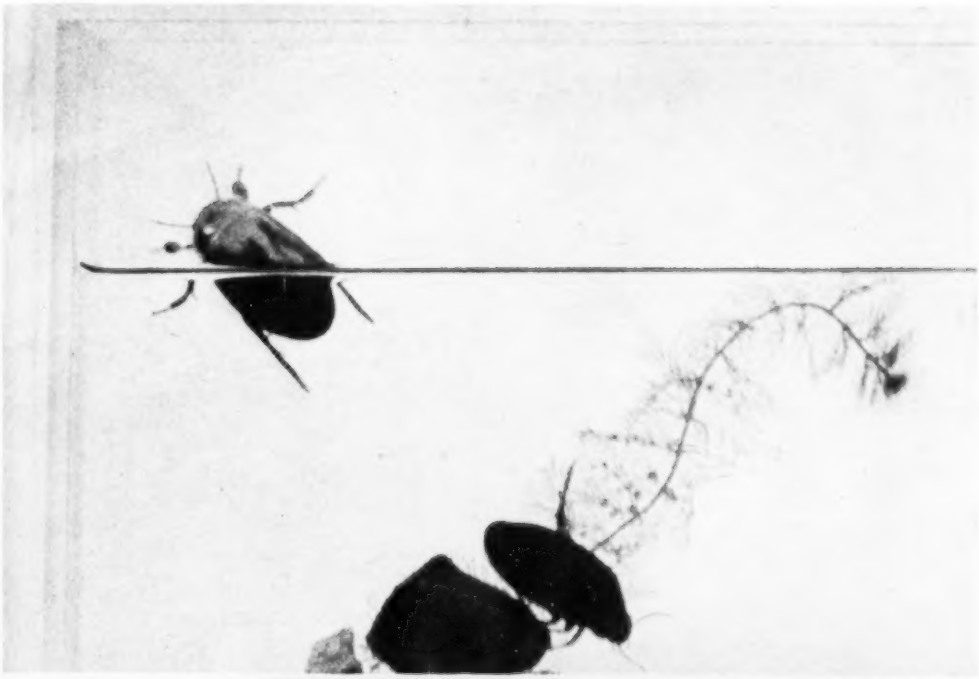
(*Above*) By 3:00 that afternoon the larva had made a new case and was occupying it. The dark object at the bottom of the dish is the larva in its new case

A TRUE DRAGON-FLY LARVA

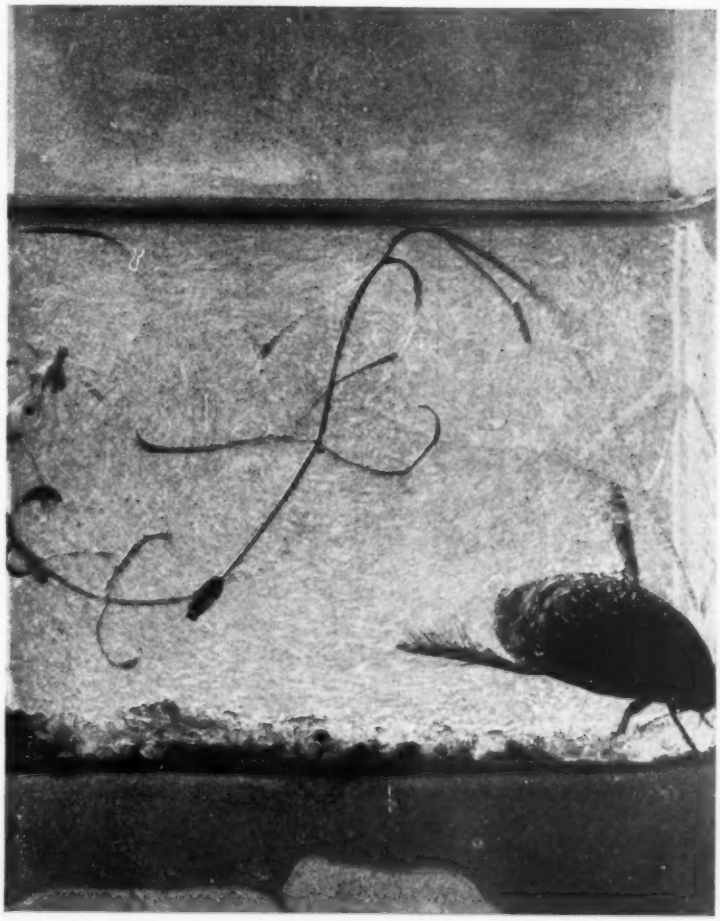
The true dragon-fly larva does not have external gills, but is continually sucking water into and expelling it from the hind part of its abdomen

A DAMSEL-FLY LARVA

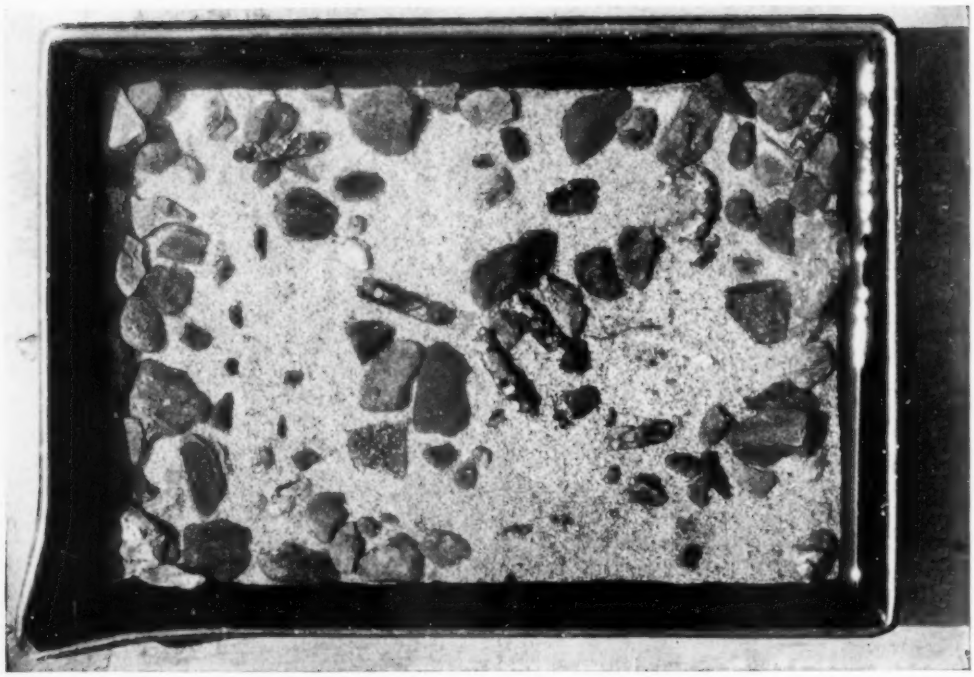
It has three fin-like gills at the hind end of its body, which take up dissolved air from the water and pass it through fine tubes to the body



AN AQUATIC BEETLE
This male *Dytiscus* beetle is crawling out of the water by holding on to the glass back of the aquarium with the help of the "sucking discs" which males of this genus have on their front legs



EFFICIENT PROPELLERS
The long hind legs fringed with hairs act as oars for both sexes of *Dytiscus*



A PHOTOGRAPHIC TRAY AS AN "AQUARIUM"
Six caddis-fly larvæ, each in its mosaic case made of small pebbles, may be seen nesting on the bottom of this simple aquarium

all (or nearly all) of their larvæ live in the water. Now, it is a curious thing that the adults of these "distinctly aquatic" orders are very "air-minded," while, on the other hand, many of the adults of the aquatic offshoots from the largely aërial groups are almost as helpless on land as a walrus is. All of this—and there is more—has a bearing on home aquaria. There need be no sameness among your pets.

A part of the "more" just parenthetically mentioned is the fact that some aquatic larvæ leave the water to pupate even though the adults may come back to their childhood environment for the rest of their lives. This is what the large *Dytiscus* beetle does and it sets another problem for those who are having insect aquaria. The straightforward way is to make a combination aquarium-terrarium, so that the *Dytiscus* or other larva with a similar urge can crawl out of the water, burrow into the earth, make a cell there, and pupate. Such combination affairs are interesting but fussy and an amateur aquarist may be pardoned for catching a "wild," not hand-raised, adult, keeping it, and excusing the neglect of the pupa by pointing out that it is not aquatic. There is a record of an adult *Dytiscus* living for more than three years in a home aquarium. It was fed on bits of raw meat when insect-prey could not conveniently be procured.

If the merry dances of the adult Gyrinid or "whirligig" beetles are desired, the aquarium must have surface, rather than depth (a glass baking dish or even a soup plate is quite the thing), and a screen top must be provided in order to keep the dancers from leaving. Like other adult beetles, these breathe atmospheric air, each carrying down a private bubble of it when he or she dives. Therefore, it is not necessary that this

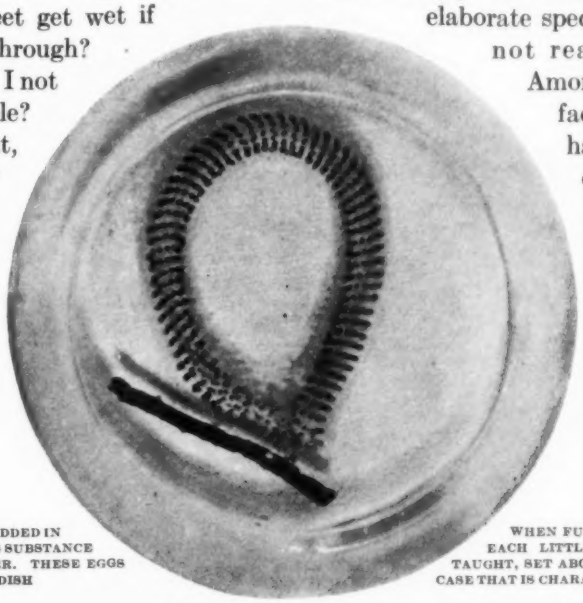
aquarium be "balanced" with plants, but one or two sprigs make it prettier and give the beetles something to cling to when they are underwater.

Water-striders are curious, even for insects. Being true bugs, they have sucking mouth parts and no quiet pupal stage. The small, wingless young resemble the larger, not always winged adults. If an adult has wings it may fly from one pond or stream to another but, except for this, water-striders do not leave the water and, yet, in none of their stages are they much more truly aquatic than is a duck. Their home and hunting ground is the surface of the water, but they do not swim. Books usually say that these insects walk on the water, but their leg-motion is not that of walking. Watch it and you will agree with the little girl who thought I was calling them by the really better name, "water-sliders."

These striders or sliders weigh something, of course, and each foot which rests on the water bends down the surface of the water but not enough to break through. Why does it not break through? Because the insect's feet do not get wet. But would not the feet get wet if they did break through? Yes. And, so, am I not talking in a circle? No; it is all straight, as you may see by trying to float needles, oiled and not-oiled, on water.

The great effectiveness of this standing-on-the-water trick is shown by the fact that water-striders (or -sliders) live in mid-ocean and are the only insects that do so. But here is something else to think about. If you keep one of these insects in an aquarium you will soon find that in trying to climb out it may get its feet wet, then its whole body, and then it will sink, and drown. This is sad if you value your pet, and may be prevented by arranging a wooden or other "shore" nearly flush with the water-level. But, if a little water in the wrong place is so fatal to these creatures, what does *Halobates* do in mid-ocean during a storm? The answer seems to be, not that "it hides under the crest of a wave until the storm is over," but that it clings, half-drowned to some floating object until it has a chance to dry off again. No floating objects, no *Halobates*, for the additional reason that, like our local water-sliders, they lay their eggs on such objects.

These are just a few of the points of interest about just a few of the really great variety of insects one may keep in small home aquaria. And, remember that elaborate special equipment is not really necessary. Among the most satisfactory aquaria I have ever had were deep glass butter-dishes that I bought in a five-and-ten-cent store.



EACH DOT IS AN EGG IMBEDDED IN THE LOOP OF GELATINOUS SUBSTANCE SECRETED BY THE MOTHER. THESE EGGS HATCHED IN THIS SMALL DISH

WHEN FURNISHED WITH MATERIAL, EACH LITTLE LARVA, ENTIRELY UNTAUGHT, SET ABOUT MAKING THE KIND OF CASE THAT IS CHARACTERISTIC OF ITS SPECIES

A Caddis-fly Egg Mass

THE MOUND BUILDERS

Who Were They?—Whence Did They Come?—Why Did They Build Mounds?—What Became of Them?

IN TWO PARTS—PART II

By H. C. SHETRONE

Director, The Ohio State Museum

WITH FOUR DRAWINGS BY ARTHUR A. JANSSON

INTERESTING as may have been the participation in the exploration of a Mound, as told in Part I,[1] it has not, as yet, answered our basic queries. Since the story of a people cannot be adequately related without reference to other peoples with whom their lives have come in contact, either in time or space, let us seek the answers to the proposed queries in a roundabout way. This leads us to a brief consideration of the important subject of the peopling of America and the dispersal of human inhabitants over the continent. While many phases of American prehistory lie beyond the possibility of absolute proof, the outline here presented conforms closely to authoritative opinion.

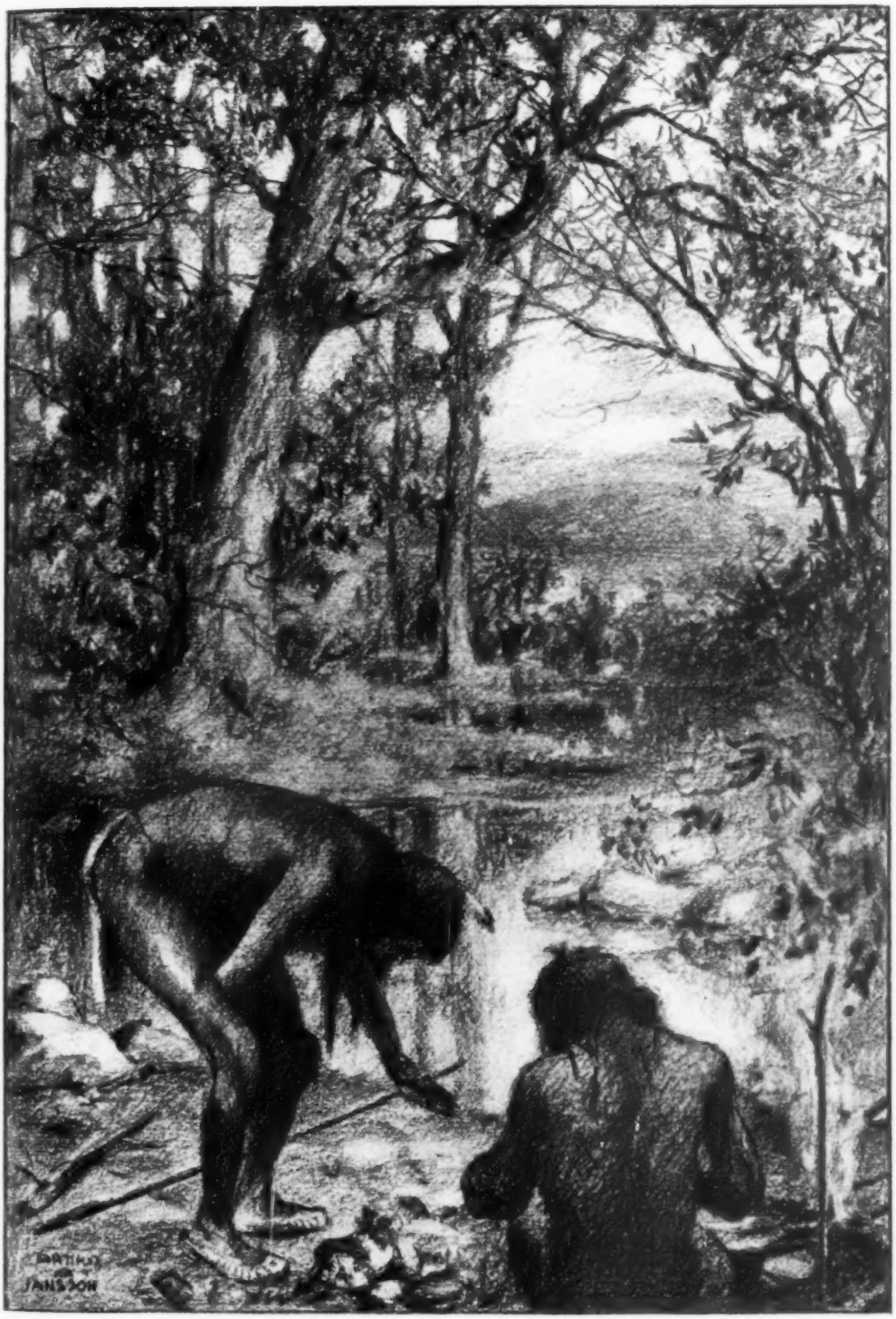
Archæological evidences indicate the existence of human beings in Europe and some other parts of the Old World for upward of a million years. Approximately 98 per cent of this vast period of time was consumed by man in passing through the very primitive cultural stages falling within the so-called Stone Age, or Paleolithic. The remaining 2 per cent, approximately 20,000 years, is believed by anthropologists to cover the duration of the New Stone Age, or the Neolithic, from which, in a surprisingly short time, the so-called civilizations of the present have developed.

Strangely enough, the western world—the Americas—affords no such evidence of antiquity in the matter of human habitancy. Absence of unquestioned proof of the presence of human beings prior to the retreat of the most recent of the several great glacial invasions, which geologists place at something under 20,000 years, leads logically to the belief that the Americas were peopled subsequent to that event. No representation therefore of the strictly Paleolithic epoch is assumed for the western world. In fact, it may be said that no evidences indicating an antiquity greater than 10,000 or 12,000 years have been adduced.

To epitomize the subject of the peopling of America the following brief statement of what may be considered as general authoritative acceptance is offered:

The aboriginal Americans, while presenting many variations in physical type and cultural attainment, are basically homogeneous and of Asiatic Mongoloid extraction; that is, they are derived from the original Mongoloid stock from which present-day Asiatic Mongolians sprang. Of the several suggested routes of entry, that known as the Northwestern route, by way of Behring Straits, is accepted as most plausible, although other peoples, using other entry routes, may have made their contributions. Their arrival in America lies somewhere between 10,000 and 20,000 years ago. They brought with them the culture of the close of the Paleolithic or, more likely, that of the beginning of the Neolithic. Their coming was not a definite restricted occurrence, but took the form of continuous or repeated cros-

[1]See NATURAL HISTORY, May-June, 1930, Pp. 293-304.

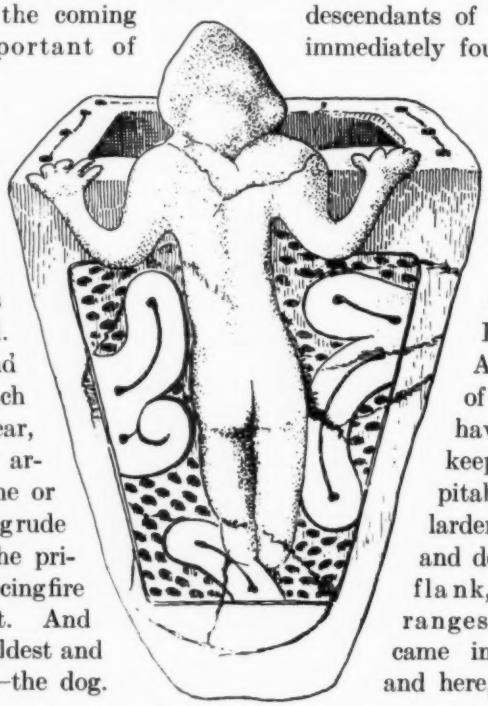


THE QUEST FOR FRESH-WATER CLAMS

SEARCHING THE STREAMS OF THE GENERAL MOUND AREA FOR MUSSELS WAS A MAJOR INDUSTRY OF THE MOUND-BUILDERS. THE MUSSELS WERE ESTEEMED AS FOOD WHILE THE SHELLS WERE MADE INTO IMPLEMENTS AND ORNAMENTS; BUT MOST IMPORTANT OF ALL WERE THE "SOLIDIFIED DROPS OF DEW," THE FRESH-WATER PEARLS—THE GEM PREEMINENT

sings by bands of migrants, probably covering years or centuries. They dispersed gradually from the point of entry, eventually coming to people all habitable parts of the Western continents, evolving into more or less distinct and different cultural units as a result, to a great extent, of the varied environment in which they came to dwell.

It may not be amiss in a popular article to indulge the imagination to the extent of picturing the coming of these most important of America's first immigrants into their new home. In our mind's eye we see the straggling bands of migrants, following their chosen leaders, pushing forward into this veritable new world. Dressed in skins and furs; equipped with such simple aids as the spear, and perhaps bow and arrows, tipped with stone or flint; perhaps possessing rude basketry; certainly the primal requisites of producing fire and of chipping flint. And trailing them, man's oldest and most faithful friend—the dog. We see them pushing southward, weary and perhaps fearsomely; for what might not lie before them? Men, women, children—and dogs. Doubtless even then the saving sense of humor was in evidence. We imagine the youngsters, when not too tired or cold or hungry, indulging youthful pranks; pulling the dogs' tails, or shying snowballs at their elders!



MOUND-BUILDER POTTERY

THIS UNUSUAL POTTERY VESSEL, WITH HUMAN EFFIGY ATTACHED, IS FROM A MOUND IN CALHOUN COUNTY, FLORIDA. REDRAWN BY H. R. GOODWIN AFTER MOORE

Onward, into a virgin land; an epic occurrence even more romantic than the great Aryan invasion, in that the land now being invaded had not previously yielded to the impress of human footprints.

Some of the immigrants into this virgin land doubtless found their way eastward across the mountain barriers and through mountain passes, out onto and across the Great Plains. Logically, the historic Indian tribesmen of the greater portion of the United States and Canada may be considered as the direct descendants of those migrants who immediately found their way eastward from the aboriginal gateway.

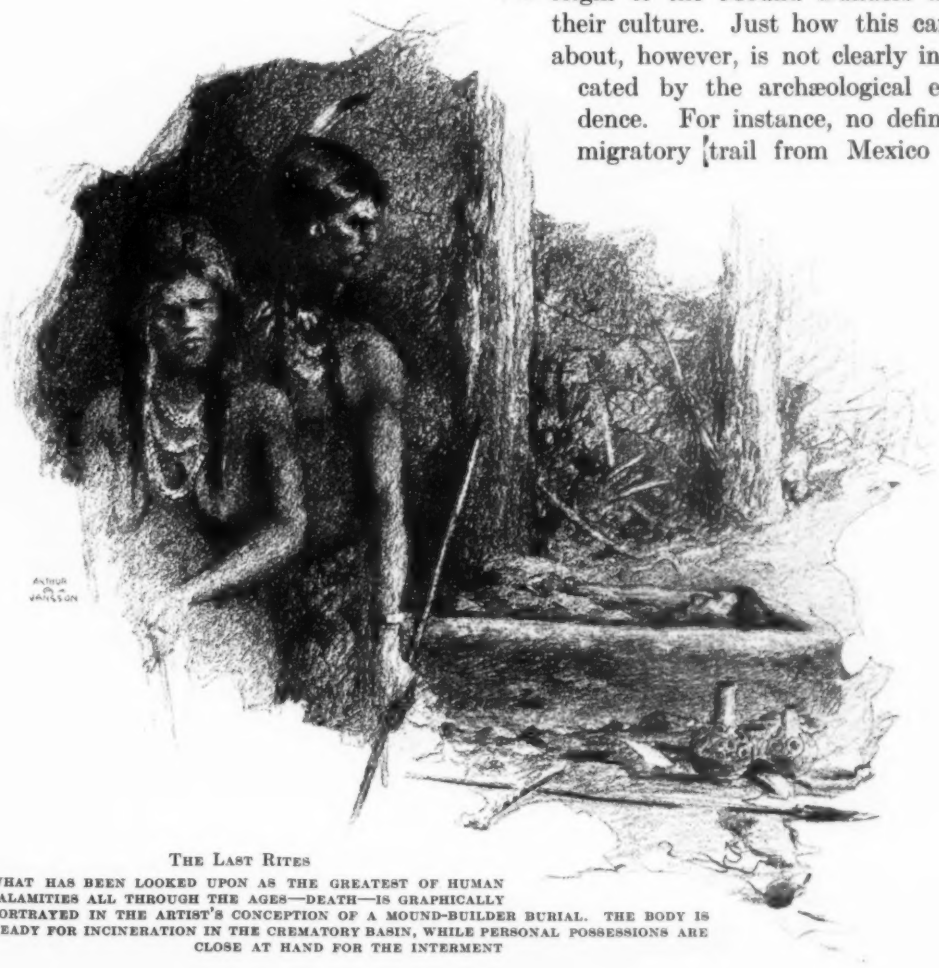
But there appears to have been another line of march, of even greater importance in so far as consideration of the Mound Builders is concerned. A considerable body of migrants appears to have trekked southward, keeping close to the hospitable Pacific, with its larder of food supplies, and deterred, on the other flank, by the mountain ranges. Eventually they came into Middle America, and here, after a long time, they were to effect a most significant accomplishment. Through the development of maize, supposedly from a native wild cereal, and the cultivation of other food plants, they became agriculturists and transformed themselves from nomadic to sedentary peoples. With the establishment of agriculture came the development of the fictile and textile arts—potteryware and fabrics—and numerous other artificial aids to existence. In the meantime the human stream had poured on into South

America to complete the peopling of the two continents.

The reader, influenced by the high standardization attending our present-day civilization, may find it difficult to comprehend the fact that there came to exist innumerable "cultures" within the wide-spread body of American aborigines. And yet, when we pause to take cognizance of the fact that under primitive conditions the vehicles which carry standardization — as communication, transportation, and literature—were of the simplest forms, and the territory concerned so vast, it will be realized that environment is a major determining factor in human culture. Thus, in great part the products of environment, we recognize numerous tribes, nations, and linguistic families; numerous "cultures," as Pueblo, Plains Indians, Woodland Indians, and Aztecs, Mayas and Incas, each culturally distinct one from another, yet all belonging to the single great race of American aborigines.

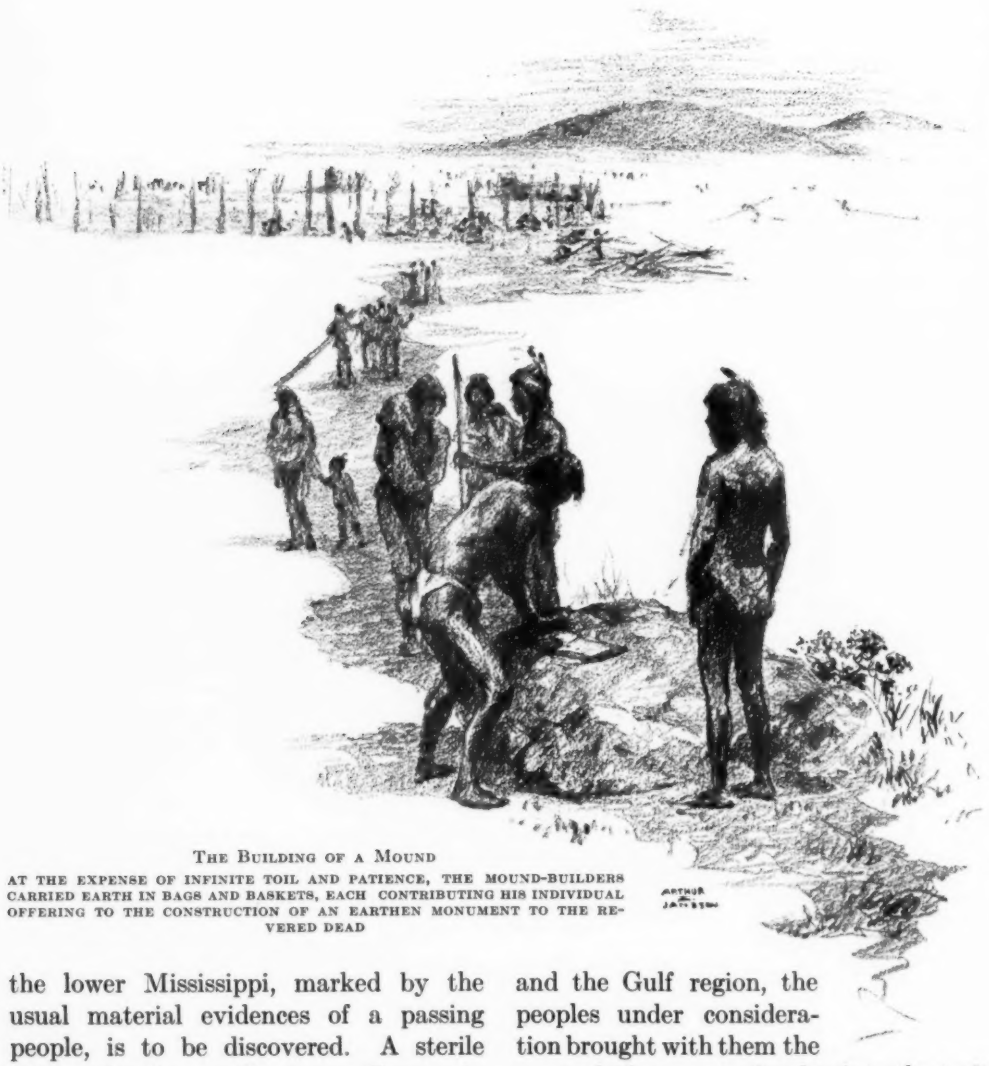
The crowning achievement, of course, of native American civilization, is to be found in the striking civilizations which developed in the nuclear area in Middle America and in the upper Andean region of South America.

To this nuclear area, probably the region of central or southern Mexico, anthropologists have come to attribute the origin of the Mound Builders and their culture. Just how this came about, however, is not clearly indicated by the archæological evidence. For instance, no definite migratory trail from Mexico to



THE LAST RITES

WHAT HAS BEEN LOOKED UPON AS THE GREATEST OF HUMAN CALAMITIES ALL THROUGH THE AGES—DEATH—IS GRAPHICALLY PORTRAYED IN THE ARTIST'S CONCEPTION OF A MOUND-BUILDER BURIAL. THE BODY IS READY FOR INCINERATION IN THE CREMATORY BASIN, WHILE PERSONAL POSSESSIONS ARE CLOSE AT HAND FOR THE INTERMENT



THE BUILDING OF A MOUND

AT THE EXPENSE OF INFINITE TOIL AND PATIENCE, THE MOUND-BUILDERS CARRIED EARTH IN BAGS AND BASKETS, EACH CONTRIBUTING HIS INDIVIDUAL OFFERING TO THE CONSTRUCTION OF AN EARTHEN MONUMENT TO THE REVERED DEAD

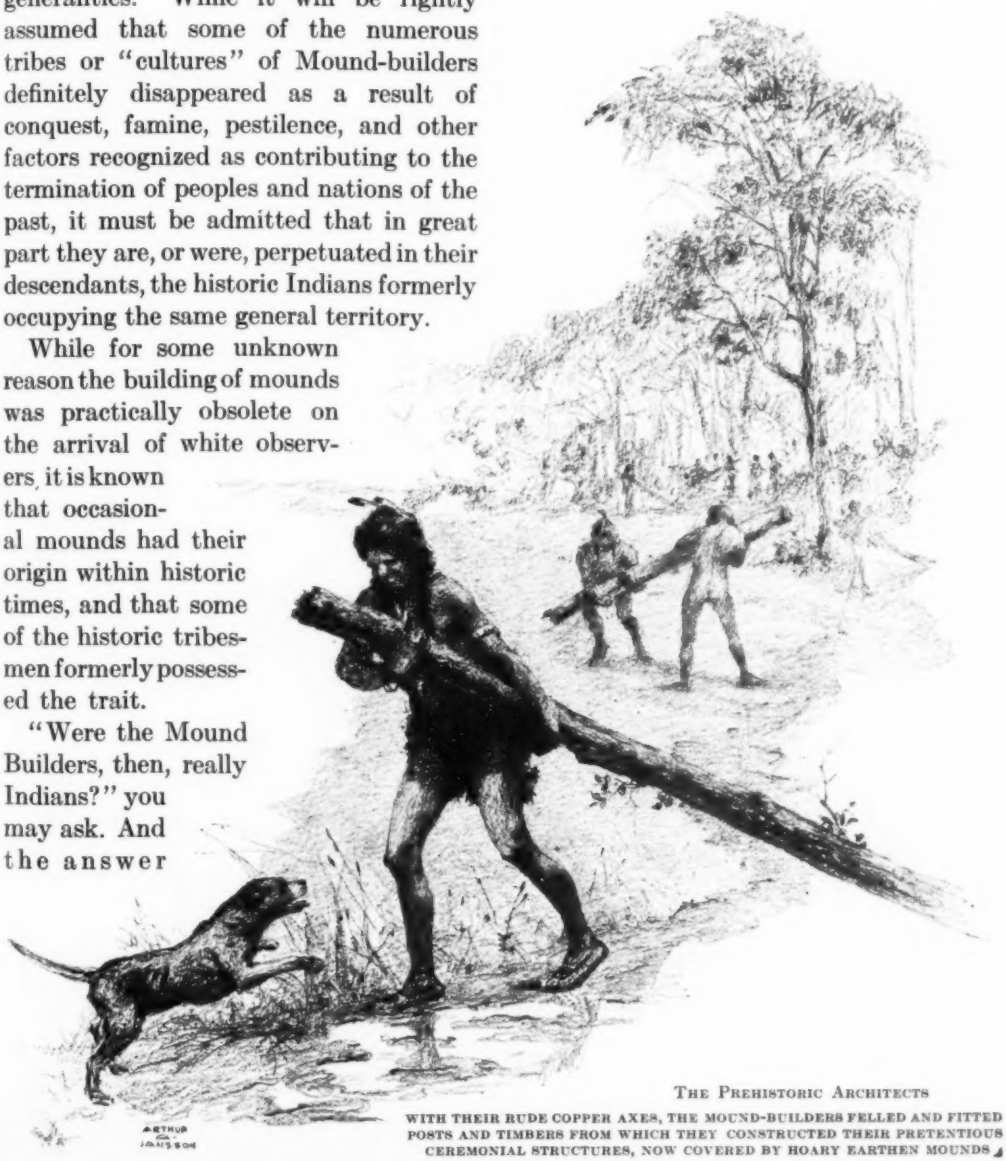
the lower Mississippi, marked by the usual material evidences of a passing people, is to be discovered. A sterile belt, extending well across Texas, in which nothing has been found indicative of either region or culture, is a most puzzling feature; and the over-water route from Mexico to the Gulf coast, sometimes suggested, hardly appears to be the solution. However, certain material resemblances, among which are the common cultivation of maize and a more than accidental or fortuitous resemblance in art and symbolism, furnish strong proof of affinity between the two areas.

Regardless of the manner in which they found their way into the lower Mississippi and the Gulf region, the peoples under consideration brought with them the germ of what was to develop into the trait of Mound-building; a trait which, back in the nuclear area was to find its analogy in the erection of great pyramids, temples, and other architectural triumphs. Pushing their way to the northward, into the valleys of the Mississippi, the Tennessee-Cumberland, and the Ohio, they doubtless met their remote kinsmen who had made the crossing by the more direct route; and to these they must have transmitted their dominant trait of building mounds. Through diffusion, or borrowing, the custom spread fan-wise to the north and northwest.

The foregoing remarks furnish the best available answers to the queries "Who were the Mound Builders? Whence came they and When? Why did they build Mounds?" The remaining question "What became of the Mound Builders?" remains to be considered. While certain specific happenings, as the Iroquoian conquest, might be cited as partial answers to the question, the really basic factors are and must continue to be generalities. While it will be rightly assumed that some of the numerous tribes or "cultures" of Mound-builders definitely disappeared as a result of conquest, famine, pestilence, and other factors recognized as contributing to the termination of peoples and nations of the past, it must be admitted that in great part they are, or were, perpetuated in their descendants, the historic Indians formerly occupying the same general territory.

While for some unknown reason the building of mounds was practically obsolete on the arrival of white observers, it is known that occasional mounds had their origin within historic times, and that some of the historic tribesmen formerly possessed the trait.

"Were the Mound Builders, then, really Indians?" you may ask. And the answer may be either "Yes" or "No." In order to understand this apparent contradiction it is necessary to consider the meanings of three troublesome words—race, culture, and Indian. The word race is a biological term, referring to physical man, and means descent from common ancestry. Culture is used to designate social development, as manners and customs, in contrast to physical attributes. The term Indian, as with race,



THE PREHISTORIC ARCHITECTS

WITH THEIR RUDE COPPER AXES, THE MOUND-BUILDERS FELLED AND FITTED POSTS AND TIMBERS FROM WHICH THEY CONSTRUCTED THEIR PRETENTIOUS CEREMONIAL STRUCTURES, NOW COVERED BY HOARY EARTHEN MOUNDS

has been variously and ambiguously construed. Primarily, Indian means a native of India. The misnomer, as it applies to the aboriginal Americans, is attributable to Columbus' mistaken belief that in discovering America he had touched upon the shores of India. Anthropologists, in lieu of a better word, designate all aboriginal Americans, past and present, as American Indians, and the word appears to be ineradicably incorporated in literature on the subject. In the popular mind, however, Indian has been applied more particularly to the historic tribesmen with whom white men have come in contact. The average person has preferred to think of the Aztecs, Incas, and Mound Builders as something different.

Keeping in mind the above definitions, we may conclude that the Mound Builders and the Indians were members of the same great race and, if we choose to accept the broader definition of Indian, that the Mound Builders were Indians. If, however, we prefer to restrict the word Indian to the historic application, only such tribes as have built mounds within the historic period may be termed Indians. Culturally speaking, we may rightly assume that the Mound Builders were peoples and nations distinct from the so-called Indians. The reader may take his choice, as may best suit his fancy.

HUMAN EFFIGY PIPE OF BURNED CLAY FROM GAHAGAN, LOUISIANA

DIGGING FOR LIZARD NESTS

Collector's Luck in the Forests and Deserts of the Dominican Republic

By WILLIAM G. HASSLER
Department of Herpetology and Experimental Biology, American Museum

MIRA! Mira, Señor! Huevos!" greeted me from nearly forty small throats, the owners of which were crowded around the door of the building that was to be "home" and headquarters during my stay at Samaná, Santo Domingo.

It was the afternoon of my second day in this little town and I had just returned from an investigation of the collecting conditions in a near-by marsh and coconut grove. I hurried upstairs, grabbed a bag of small change, several boxes and cages, and returned to the children who milled about me as soon as I had seated myself on the lower step.

I had told some, the day before, that I would buy "huevos de lagartijas," and so they had taken a chance. Grimy and sticky hands, thrust under my nose, were grasping bottles, discarded match boxes, pill boxes, in fact almost anything that would hold lizard eggs and lizards, frogs, snakes, and even centipedes and spiders.

A policeman had come to chase the children, but on their insistence that "el Americano" had said he would buy lizard eggs, he had stayed, skeptically, to see what would happen. He came to my rescue and together with my guide kept a semblance of order, while for nearly an hour I bargained for eggs and a few of the best of the other specimens. When finally the last child had gone off glowing with the knowledge of newly acquired wealth, I counted my purchases to find I had seven hundred and five lizard eggs!

Thus started a series of most interesting experiences in the Dominican Republic while I was collecting living reptiles and their eggs together with data on their habits, for the department of herpetology and experimental biology in the American Museum.

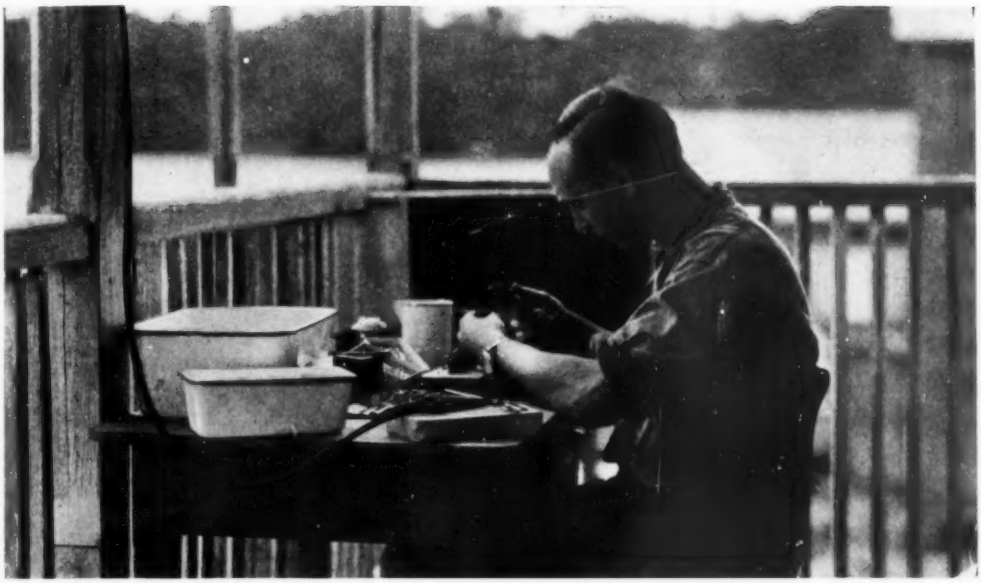
Reptile eggs and even small living lizards were sent through the mail to the Museum. Well-rotted wood, crushed and pulverized, was the best packing medium, as it supplied the necessary moisture yet was light in weight. The collections of snakes and larger lizards were sent on in cages on the S. S. "Huron" when she called every three weeks. For two or three days before each of her visits the mornings and evenings would be repetitions of the original experience, with

children and even adults bringing in all sorts of creatures.

The hall of my headquarters was converted into a zoo with a row of cages suspended from a rope along the wall. It was necessary to do this because the ants made short work of the smaller animals if left on a table or the floor. One species of lizard was particularly bothered by the ants. These lizards were small ones related to the larger geckos. A local superstition says that if one of these "salamaquesa," as they are called, is found in a house, particularly a bedroom, a baby will be born there within a year. I wonder what will happen to the birth rate at Samaná, since I sent out nearly 2,000 lizards, most of which had been caught in the homes there. The houses, however, were not the only places in which we found them. Piles of coconut husks yielded these, together with any number of other animals. Big hairy spiders, small snakes, various lizards, frogs and their eggs, and even rats were caught in these places,—just about everything that most people detest. These "salamaquesa" had one habit by which we profited when other hiding places were scarce. They would lay their eggs in the intricate passages inside of termite nests which were abundant everywhere in trees and stumps. The termites or "white ants" in this way became easily secured food for both adults and young.

One day while John King, a native who was my guide, and I were out searching for specimens, we discovered on a "fig" tree three white objects about the size of large marbles clinging to the

"MIRA, SEÑOR, HUEVOS!"
These children came in flocks with small lizards and their eggs to sell. They would pour into the house whenever they could, and sometimes it seemed that the only way to get them out was to take a snake out of a cage and walk toward them. That usually was sufficient



POSING A "SALTA COCOTA"—THE FIRST STEP TOWARD INFILTRATING IT
The preliminary steps of the paraffin infiltration method were performed in the field. The later steps in the process were to be carried out in the American Museum where the specimens will be placed on exhibition. Mr. Hassler is doing this work on the porch of his headquarters at Samaná

smooth gray bark about twelve feet above the ground.

I climbed up on the root-like protuberances which make these trees so characteristic, and discovered to my astonishment that the objects were some sort of egg, fastened firmly to the smooth bark, and so thin and brittle that one cracked the moment I attempted to remove it.

John followed me up and cut out a section of the bark, but the cracked egg broke open farther and disclosed an embryo lizard nearly ready to hatch. It was the young of *Aristelliger*, the largest geckonid lizard found on the island, regarding whose eggs or young nothing was known. This gave us a clue and in the days that followed we spent many hours searching for the adults, young, and more eggs.

The lizards grow to a length of slightly more than twelve inches. They have very thin skins of a velvet-like texture, the ground color of which is brown marked with a pattern of darker blotches that in some places approach a deep black and in others a purplish hue. These colors fade or become intensified according to the mood of the animal. After careful search we found that these lizards inhabit only the one kind of tree, the strangling fig, which is so admirably suited to their needs. The bark is smooth, giving the adhesive pads on their toes admirable opportunity to cling, and a surface on which the eggs may be firmly attached. Also, who could conceive of better hiding places for these peculiar lizards, which like tree frogs, seem a very part of the tree they inhabit, than the intricate crevices, passage-ways, and hollows which abound.

The eggs we found in varying numbers sometimes attached on the sides of the trees in the open, sometimes in crevices or under loose wood on dead limbs, and sometimes even in hollows inside the trunks. The shell was milky white, granular, and often showed the marks of

TWO *ARISTELLIGER* EGGS IN A HOLLOW TREE

The natural hollow was reached by a small opening opposite the one made in order to show them. The eggs are firmly attached to the bark

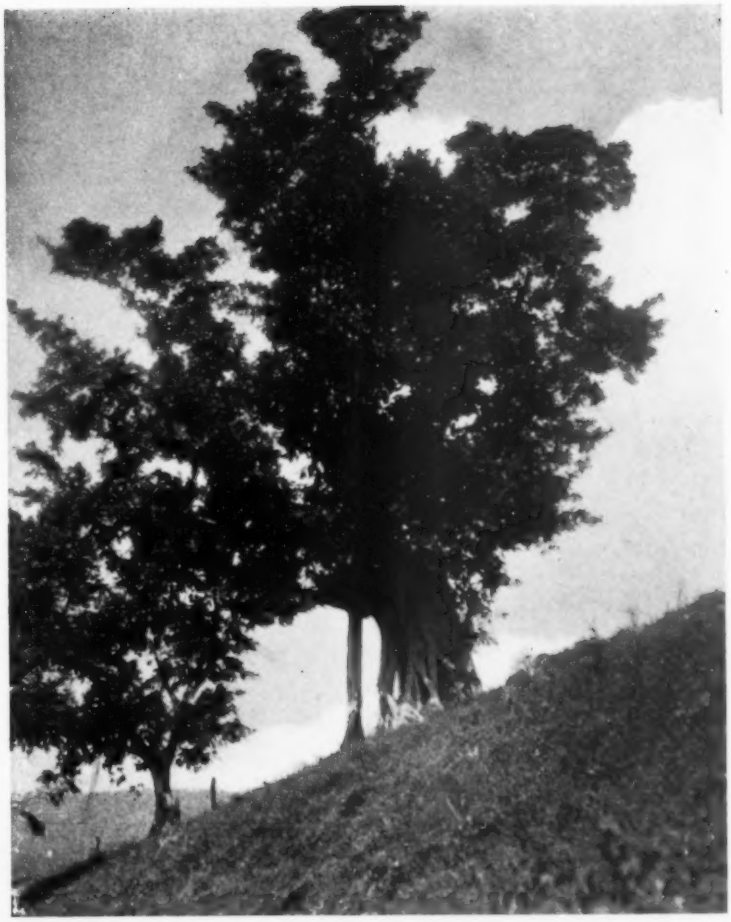
REMOVING THE FIRST EGGS OF THE BIG GECKO

It was by accident that the expedition discovered the eggs of *Aristelliger lar* fastened to the side of this tree.

John King, guide of the expedition, is here removing a section of the bark with the eggs attached

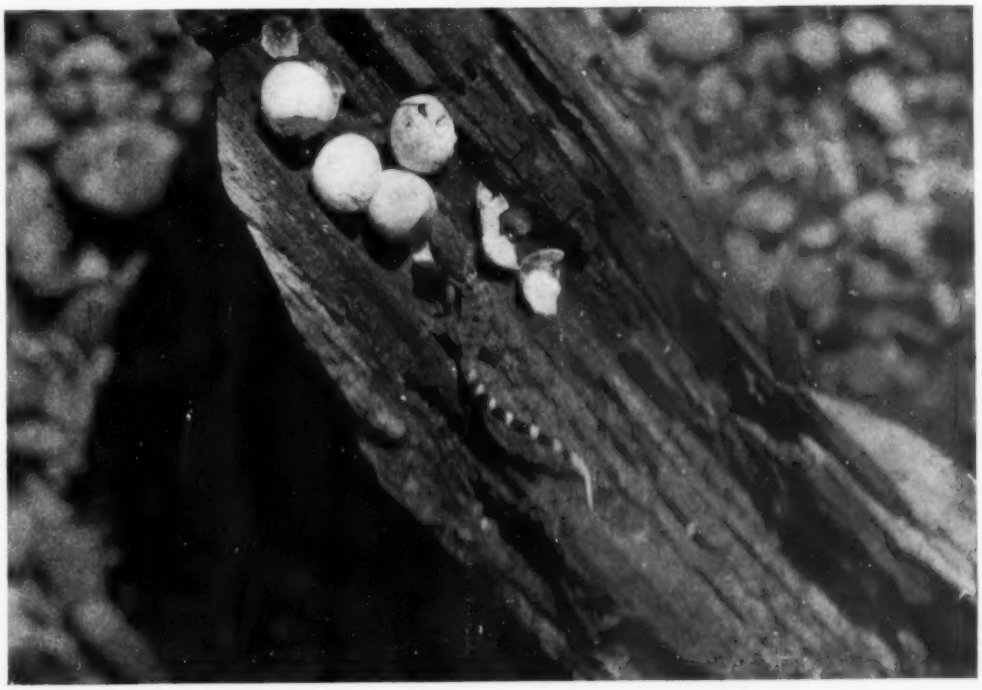
THE MONARCH OF THE HILL

This large strangling fig tree was the home of a colony of *Aristelliger* which lived in its mass of aërial roots



EGGS AND YOUNG OF THE BIG DOMINICAN GECKO

The natives, when questioned, had never seen the eggs of this lizard, *Aristelliger lar*, and few recognized the adults. They usually confused them with the "Salta cocota"



GOING UP FOR A DRINK
An abundance of coconut trees saved the members of the expedition the necessity of carrying canteens. They were also excellent collecting places for the smaller species of *Anolis*

the ventral scales of the adults as they must have lain over the eggs, pressing them against the wood. One large tree on the top of a ridge near Samaná yielded the most specimens—ten in all taken on different days.

Another species of large lizard with adhesive pads on its toes, but of entirely different family relationship, was also found living in trees near Samaná, and more abundantly in the forests about Laguna, a tiny settlement about eight miles inland. It is called by the natives "salta cocota" or "jump on your throat" and is popularly considered poisonous. In reality this giant *Anolis*, of the same genus as our so-called "American chamaeleon," is one of the most wary and difficult to approach. It can inflict a severe bite, but it is devoid of poison.

From Samaná I made numerous side trips for various species. At Laguna, besides the salta cocotas, we collected numerous smaller anolies, numbers of an interesting small burrowing lizard, wormlike legless lizards, and a species of small blind snake. These latter two look much alike and were found under rotting logs. Long, slender, green tree snakes were also abundant here. They feed on lizards which, as they swallow them they paralyze with poison from fangs in the rear of the mouth. Several species of back-fanged snakes are found in the island but, because the fangs are situated so far back in the jaw, they are not considered dangerous to man. There are no other poisonous reptiles found on the island.

Next we visited Los Flechas, where tradition says that Christopher Columbus had his first hostile encounter with the Indians in the Americas. For that matter it is supposed that the Indians he took back to Spain came from the vicinity of Samaná. Here at Los Flechas, a little native settlement on the shore of the Bay of Samaná, we secured more facts about *Aristelliger* and added to our general collection. *Aristelliger*, like many other lizards, is capable of breaking off its tail very readily when grasped by this appendage, and thus often makes its escape. In time it grows a new tail. One

big fellow that we had caught, broke off its tail while struggling about in the bag in which it was carried. That evening I hung the bag from a nail in the wall together with some others. The next morning I discovered a small hole in the bottom of the bag. On looking inside to see if the lizard had escaped I saw that it was there but the tail was gone! Some mouse must have dined on lizard tail during the night!

At the extreme eastern end of the peninsula the condition of the country differs somewhat. It is much more dry, streams are very few, and the volcanic rock of which that part of the island is composed breaks through the surface at frequent intervals. Here we hoped to secure a series of *Ameivas*, which are terrestrial lizards and of which there are four species found on the island. We had found a few individuals living in the grass along a roadside at Samaná and a few more on one of the small islands in the bay. These lizards were of a forest species that, though they are confined to the more humid parts of the island, are very adverse to actual dampness. Up in the dry area we hoped they might be more abundant. We searched in fields and coconut groves and along the beaches until we found an old abandoned garden where the lizards were fairly numerous. But to our disappointment we found them to be the most wary of lizards. They would lie in the sun twitching nervously, and at the slightest sign of danger, would dart under tangles of brush, vines, or other places of safety. Our plans to collect a quantity alive were decidedly unsuccessful.

Sabana de la Mar, across the bay from Samaná, was the last place I visited while in the Province of Samaná. Behind it is a strip of savanna land which is inhabited by a species of lizard not common on the other side of the bay, and a species of frog that does not occur on the other side at all. The frogs of Santo Domingo may be grouped under four heads, two of which predominate. The members of

THE ROOFS OF SAMANÁ
Christopher Columbus may have anchored in the harbor beside Carenero Island when he visited Santo Domingo in 1493

THE "SPRING PEEPER" OF SANTO DOMINGO

This little frog, *Eleutherodactylus flavescens* whistles surprisingly like our spring peeper, *Hyla crucifer*. The frogs sit on the leaves of bushes on damp nights, and their calls, blending with those of hundreds of other small frogs, make a constant volume of sound

A "SALTA COCOTA" AT BAY

These large aboreal lizards, *Anolis ricordii*, are very shy despite their native name, which means "jump-on-your-throat," but when cornered, they are vicious, raising the throat fan, hissing, and biting

A SMALL "MARIGUANA"

This specimen has been hardened and will be infilltrated with paraffin. This pretty little lizard, *Ameiva lineolata*, was previously represented in the American Museum's collections by only a few specimen but the expedition was able to secure several hundred

A "BARKING FROG"

This frog, *Eleutherodactylus inoptatus*, was traced by its call one night to where it clung in a depression in the side of a palm tree. It tried to make itself inconspicuous by crouching deeply in a hollow in the trunk

AN AUTOMATIC FERRY

Crossing the Guayubincito about sixteen miles from Monte Cristy was this odd ferry, operated by the current striking the pontoons on an angle. The section hereabouts was at one time a great cattle-raising country

these latter two, *Eleutherodactylus* and *Hyla*, are largely arboreal. In fact, *Hyla* is the same genus as our American tree frogs. However, despite similar appearances and habits of these two groups, the egg-laying habits are entirely different. The *Hylas* lay their eggs in water, where the young undergo a tadpole stage, but the *Eleutherodactylus* lay their eggs on land in little clusters in damp places such as under coconut husks and at the base of leaves, and the young, when hatched, are already miniature frogs, having passed through the tadpole stage within the egg!

The other two groups are apparently confined to one member each. They are a species of *Bufo*—a toad, and a species of *Leptodactylus*—a small terrestrial frog. The toads, like our northern ones, lay their strings of eggs in water, but the *Leptodactylus* lays its eggs in a small moist depression in the ground, surrounded by a frothlike substance to retard evaporation. It was this last form that I found at Sabana de la Mar but not on the peninsula.

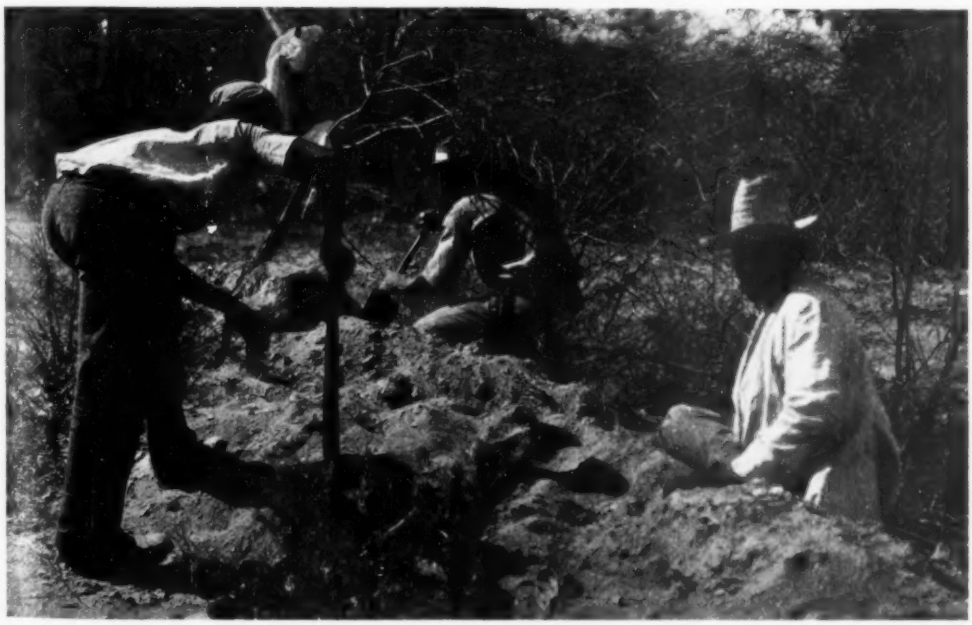
Another phase of my work, besides collecting specimens to send back alive and for the regular preserved series, was to pose and harden a number of animals illustrating various striking groups to be brought back and infiltrated with paraffin. After this treatment they will be put on exhibition. This work was most interesting and occupied much of my time between trips. Living examples were observed and their postures noted. Then they, or similar ones, were anesthetized and, after being posed, were injected with a hardening solution which would "set" the colors and firmly fix the animal without shrinking it. They were kept submerged in this solution for several days and then transferred to alcohol to await subsequent treatment in the laboratories in the Museum.

After completing the work at Samaná I packed my equipment and a last batch of animals, and on the morning before Christmas boarded the "Huron." She was to take me to Monte Cristy on the north of the island, where amid entirely

different conditions I intended to study several other species of reptiles, getting data on their habits and finally sending a living series of these also to the Museum.

Monte Cristy, instead of being in a rough and hilly rain-forest region like Samaná, is nearly flat and very arid. At Samaná we had rains every day or so, while at Monte Cristy there had been three rains in the past thirteen months, yet the two localities are less than ninety miles apart in a straight line. Here in this hot dry climate certain lizards were very abundant. Two species of *Ameiva*, other than the one we had tried so hard to catch at Roja Cabo, were numerous, as were two of *Leiocephalus*. Other species of lizards were also found and a number of snakes, and our days were spent tramping about over the rolling cactus-covered country probing into holes, digging out nests, and otherwise gathering facts and specimens. My headquarters here was a private home, the owner of which graciously allowed me to keep my acquisitions in the back yard. Here in boxes and cages of all kinds my zoo increased to almost a thousand lizards, snakes, and finally a small burrowing owl. Here, too, the people came to sell me specimens, but this time there were nearly as many men as children.

One particular phase of the work here was to add, if possible, to the data brought together by Mr. Gilbert C. Klingel, who visited Haiti the year before. Under the slightly different conditions, we found that habits differed somewhat and some new facts were added. Besides the *Ameiva chrysolæma* which had engaged Mr. Klingel's attention, we found a beautiful little *Ameiva lineolata* quite abundant. It is very slender with about ten thin yellow stripes on a black back, and it has a brilliant blue tail. Previously it was represented in this country by only a few preserved specimens, but we were able to add substantially to this



THE QUEST FOR LIZARD EGGS

Ridges of coral gravel were profitable collecting grounds, and it was all the expedition could do in some localities to keep from being overwhelmed by natives anxious to earn a few cents by helping to dig

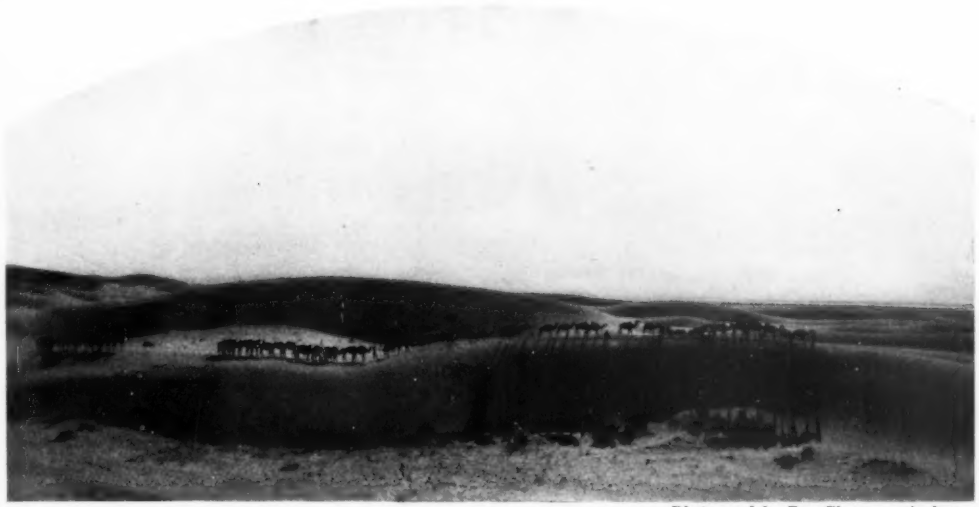
number. The nests and eggs of both these species were found, many adjoining each other. In some places they burrow in sandy soil or in decomposed coral, and in other places in the dry dirt under cactus patches. An interesting habit of these two species, which enabled us to collect numbers of them ever so much more readily than would otherwise have been possible, was that many were estivating in a semi-dormant state. Hillocks of sand and dirt which showed evidence of burrows were dug into and in most cases yielded specimens, which, when uncovered, would try clumsily to escape. Whether they were found only a few inches under the surface or as deep down as three feet, they were cold and drowsy when dug out. Those on the surface in the sun had a higher body temperature, in some cases nearly 30 degrees more, and were so nervous and active that they were caught only with difficulty.

My stay in Monte Cristy included a trip up the river into slightly more humid country where comparisions of the fauna were made. At another time we crossed a tributary of the river on a ferry made of two flat-bottom boats planked down and fastened by two chains and pulleys to a cable across the stream. To go across, the ferryman would simply pull one chain short, thus canting the boats to the current which, striking them at an angle, propelled the ferry across.

A word of thanks is due to those whose assistance and friendship made my work so much more pleasant than it otherwise would have been, as well as to the government officials who aided me materially.

One of the last things I did before leaving the island was to climb the Morro, that huge mound of rock and dirt that rises so sharply out of the plains by the coast. On the plateau at the top, not quite a mile in length and about 900 feet above the sea, we found the blue-tailed *Ameiva* and a species of the *Leiocephalus*, together with one kind of *Anolis*. Three wild goats broke cover in front of us and faded again into the dense woods that cover the top. We could see Monte Cristy and the bay with its island spread out below us, while the sun sent a glistening molten sheen over the ocean as it dipped in the west.

Sunset on Samaná Bay



Photograph by Roy Chapman Andrews

A scene in the Gobi Desert

DESERT ROSES

Groups of Overlapping Platelike Crystals Deposited by Ground Water in Desert Sand, which Resemble the Petals of a Rose

By HERBERT P. WHITLOCK
Curator, Minerals and Gems, American Museum

SINCE the automobile has opened up many places that only a few years ago were considered distinctly inaccessible, a number of curious and remarkable things have been added to the sum of those with which we are more or less familiar. And perhaps there is no continent where the motor car has done more in recent years to enlarge our world experiences than Africa. It is no longer considered a dangerous adventure to visit the oases of the Sahara, and one now meets the omnipresent representative of Messrs. Thomas Cook and Sons almost as frequently in Biskra as in Berlin. Travelers who have returned from these excursions into the "Garden of Allah" have brought with them certain curious objects, sand-brown in color, that at first sight almost seem to be modeled from the hardened desert sands, so closely do they resemble flower forms carved from stone. They are the "desert roses" that may be picked up from the surface of the desert in certain places, and are best seen when the low sun casts long shadows, since in color they almost exactly match the sand from which they emerge.

Many have been the speculations as to the nature and derivation of these strange and attractive "sand roses," speculations that are, for the most part, wide of the truth, since the desert of Sahara would seem to be the last place in the world where we would seek for something that had been formed through the agency of water. And yet that is exactly what has happened in the case of the Sahara desert roses. They are in reality groups or aggregates of crystals deposited by water in the midst of the desert sands, and embracing in their formation some of the sand which also surrounded them in the process of their genesis.

The ground water present in the sands of a desert filters through the various layers of sand, dissolving the mineral matter that is the most abundant and the

DESERT ROSE FROM THE SAHARA

Like veritable flowers molded in stone, this aggregate of gypsum crystals lifts its petals above the sands of the "Garden of Allah." It comes from the neighborhood of Biskra, Algeria. Presented by Mrs. Charles F. Blake

most easily soluble. It carries this dissolved matter with it, until in the course of time, evaporation causes the moisture to give up its load of dissolved matter. This forms either a crystallized mineral or, if the process has been hastened, a concretion.

In the Sahara desert formations, the dissolved matter in the ground water was calcium sulphate and the resulting crystal aggregates are groupings of gypsum crystals.

When we consider the multitude of different but related shapes that constitute the varied crystal habit of the mineral gypsum, we find conspicuous among them certain rounded plates, caused by an oscillation between several crystal forms, and displaying on two opposite edges the familiar gypsum cleavage. Such platelike crystals assembled in overlapping piles strongly resemble the petals of a rose.

A DESERT ROSE FROM OKLAHOMA

This close aggregate of sand barite crystals comes from the Great Plains of the Middle West, United States. It is one of the so-called petrified walnuts of that region. Collected by Dr. Chester A. Reeds

DESERT ROSES FROM THE BAD LANDS

Even such an unprepossessing place as the Bad Lands of South Dakota may produce stone roses. These radiating forms are composed of sand calcite crystals

The sands of a desert such as the Sahara are never still, and as the sand shifts and travels, piling up hillocks and scooping out little valleys, the surface gradually recedes in places until the sand roses are uncovered and lie exposed.

The deserts of Central Asia also have their desert roses, of marked similarity to those of North Africa, and composed like them, of gypsum crystals. From the few specimens available to the writer, these roses of the Gobi seem to be lighter in color than the Sahara sand crystals, they appear to occur in groups of larger individuals (the petals of the roses are larger), and they are comparatively free from enclosed sand grains.

But gypsum is by no means the only mineral that forms in sand beds in shapes resembling in their crystal aggregates those of organic nature.

A DESERT ROSE FROM THE GOBI

Flower-like groups of gypsum crystals such as this, are abundant on the desert sands in the Sahara Murum region of Inner Mongolia. Collected by the Central Asiatic Expedition

A DESERT ROSE FROM FONTAINBLEAU

Composed of finely formed sand calcite crystals, this stone rose from an ancient Oligocene desert seems to have been modelled by some cubist sculptor. It comes from Bellecroix, Fontainbleau, France

The Great Plains of our own Middle West furnish some striking examples of these very interesting formations in calcite and barite. From the Permian Red Beds of Central Oklahoma come the "sand barite crystals" which are no less desert roses than the gypsum forms of the Sahara and the Gobi. Like these latter, the barite roses are composed of overlapping flat plates rounded in outline, and reddish or brownish in color; but they contain a much higher percentage of silica grains than the gypsum crystals.

Locally the Oklahoma aggregates are known as "rosettes," "petrified roses," and "petrified walnuts," the latter name being suggested by certain types in which the barite plates are so grouped as to present their rounded edges in ribbed masses resembling artichokes more nearly than walnuts. Similar barite sand crystals are found in Central Kansas. These desert roses, like those of Oklahoma, are chiefly composed of sand in rounded wind-worn grains.

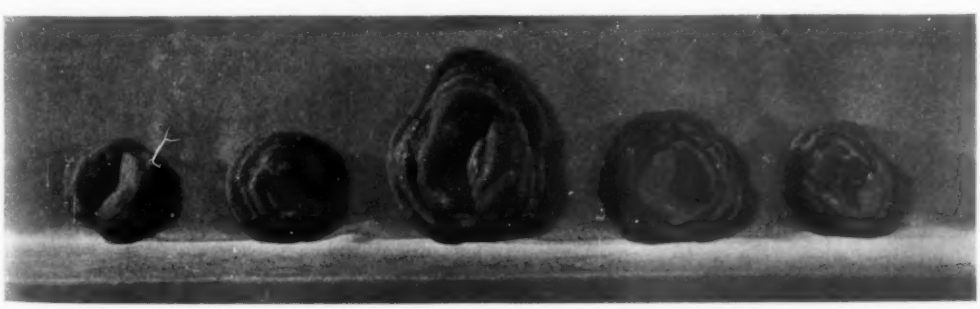
By far the most interesting and suggestive of the sand crystals or "desert roses" furnished by the Tertiary beds of the area extending through western Kansas, Nebraska, and South Dakota, are found in the Bad Lands of northwest Nebraska, and Southwest Dakota, where calcite crystals enclosing a high percentage of sand have been exposed in several localities. They are especially abundant at Devil's Hill in Washington County, South Dakota. Here calcite crystals enclosing more than 60 per cent of sand occur as isolated individuals of a rounded pyramidal form, resembling blunt spindles. One can trace *through* the substance of these calcite crystals the laminations of the sand beds in which they were formed and one can readily see that they rested in the bed at various angles from the perpendicular with relation to the bedding

plane. Higher up in the sand beds, which are between ten and fifteen feet thick, the sand calcite crystals are much more abundant and are grouped in loose aggregates joined at haphazard. Higher yet, radiating groups in close aggregation form veritable desert roses, and toward the top of the formation, where perhaps rapid concentration of the calcareous solutions militated against the formation of crystals, concretions and pipes represent the cryptocrystalline phase of calcite deposition. It would seem that here within a relatively small area the whole story of these highly interesting natural forms were unfolded in no uncertain terms, and that one might trace the stages in their formation with ease and certainty.

The desolate Bad Lands of South Dakota and the forest of Fontainbleau near Paris seem to us to have little or nothing in common, and yet, here, in the heart of the Paris basin, a little digging in the sand beds will reward one with sharp, well formed calcite crystals that, like those from Devil's Hill, are more than half sand. The Fontainbleau sand crystals are steeply rhombohedral in habit, with points considerably sharper than the corners of a cube, and with the points overlapping until the aggregates suggest highly modernistic conventionalizations of a rose. And are these stone blossoms from the famous forest true "desert roses"? It would seem so, for the sand that constitutes more than fifty per cent of their composition is certainly desert sand. There is no mistaking the rounded wind-blown character of the individual grains when seen under the microscope. Prof. A. Lacroix[1] has pointed out that "from the point of view of internal structure and origin, these crystals are comparable to those formed of gypsum from the Algerian Souf."

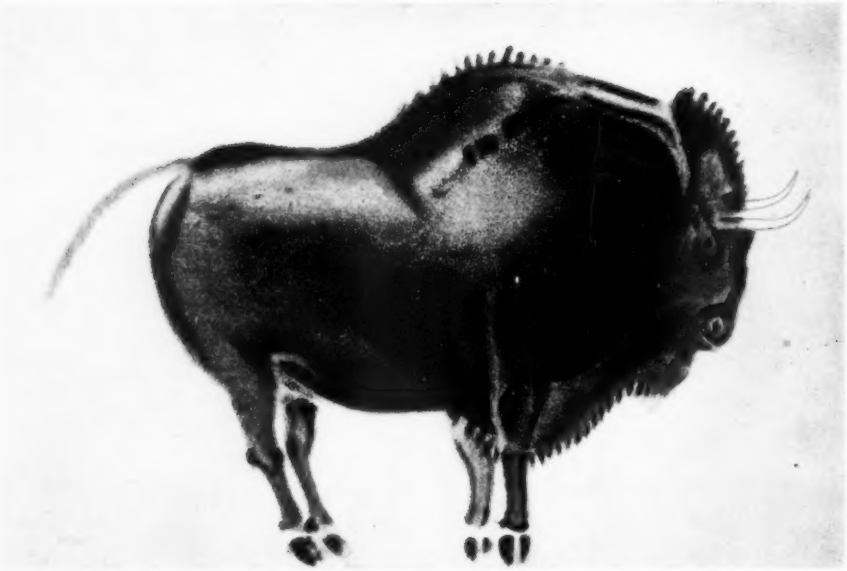
And as if further proof were needed, there have been found in Vaugirard, in the evirons of Paris, gypsum crystal aggregates, which are exactly like the desert roses of Algiers. To be sure, the Vaugirard aggregates have been replaced by quartz at some time subsequent to their formation, but, setting them side by side with the Sahara formations, it is not hard to believe that a desert of Oligocene age once covered the part of Northern France that is now the city of Paris.

[1]A. Lacroix, *Mineralogie de la France et de ses Colonies*. 1901, III, page 517.



AMERICAN DESERT ROSES

Rosettes of sand barite crystals from eight miles southeast of Norman, Oklahoma. In grouping, although not in composition, these desert roses closely resemble those from the Sahara and the Gobi. Presented by Charles N. Gould, Director of the Oklahoma Geological Survey



A bison drawing from a fresco on the ceiling of the cave of Altamira. After Breuil

ALTAMIRA

THE CAVERN OF THE STONE AGE ARTISTS

An Account of the Extraordinary Spanish Cave upon the Ceiling of which Artists of the Stone Age Painted Their Remarkable Pictures of the Animals of Prehistoric Times

By PROF. DR. HUGO OBERMAIER
University of Madrid

Translated from the German by Helen Gunz. Revised by N. C. Nelson
The American Museum of Natural History

THE Altamira cave, famed far beyond the borders of Spain, is situated thirty kilometers west of Santander (Bay of Biscay port) in the immediate neighborhood of the ancient little town of Santillana del Mar, whose glorious past is still manifested by a series of art monuments, themselves richly repaying a visit.

Primitive man roamed over this region already in early Palæolithic times, as is proved by a considerable number of implement finds made in the course of the last few years in the Quaternary clay deposit on the northeastern slope of the flat hillock near the summit of which the 270-meter long cave opens into the limestone formation. The implements are flaked from quartzite and consist in part of typical *coups-de-poing* (handwedges) and in part of large "choppers" which are retouched on one face only and have a rounded butt and a straight cutting edge. We must ascribe these tools to the Acheulean and Mousterian culture levels, i.e., to the period when the last interglacial age was drawing to a close, because the same industries appear in association with the straight-tusked or ancient elephant and Merck's rhinoceros in the not very distant Castillo cave at Puente Viesgo.[1]

The first occupation of the stately

[1]For more complete explanation, see the works of H. Obermaier, *Fossil Man In Spain*, Yale University Press, New Haven, Conn., 1924, and *El Hombre Fosil*, 2d Edition, Madrid, 1925.

entrance hall of the cave itself is to be assigned provisionally to Aurignacian times. My excavations, carried on during the years 1924 and 1925, furnished, scattered among gigantic bowlders, clear evidence of this culture stage (simple notched and stemmed points of the Font-Robert type); but thus far I have not succeeded in reaching the original cave floor, because the work of clearing away the débris has proved extremely difficult, the use of explosives being impossible. The fact that in the cave interior simple paintings and engravings are found which, according to information gained elsewhere, belong to Aurignacian times, corroborates this theory of early occupation.

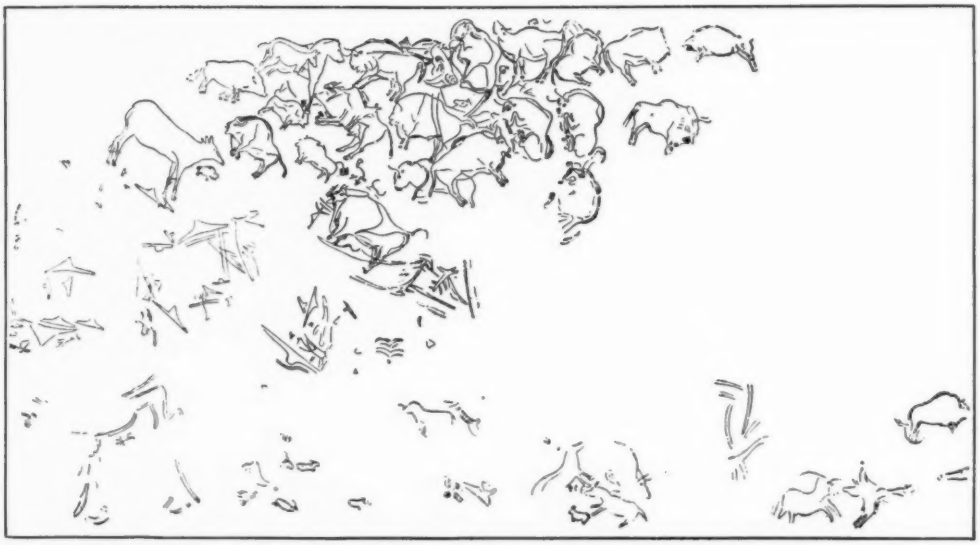
Active life continued in the cave during subsequent Solutrian and Magdalenian times. The principal game animals were the wild horse, the bison, and the stag or red deer; besides which I came upon remains of the marmot, chamois, ibex, bear, deer, and wild hog; also, more rarely, with those of the reindeer, northern seal, wolf, lynx, and fox. The brooks yielded fish, as did the near-by sea, from which were fetched also astonishing quantities of shellfish, especially the periwinkle and limpet (*Litorina litorea* and *Patella vulgata*) for consumption in the cave. Both these univalve species are far more strongly developed than their descendants of the present day. In several archæological stations of the same age, in the adjoining province of Asturias, these univalves are usually accompanied by such northern bivalves as the clam and scallop (*Cyprina islandica* and *Pecten islandicus*). We are dealing obviously with arctic conditions, and in fact with the last glacial advance, during which the Cantabrian cordillera lay buried under snow and ice.

The Solutrian stratum belongs to the younger half of this stage and contains notched points expertly fashioned from flint or brittle quartzite—among them the Cantabrian variant with short side-barb; also laurel-leaf points with concave base, end scrapers, keel scrapers, discoidal scrapers, gravers, and the like.

Photograph by Prof. H. Obermaier, 1928

ENTRANCE TO ALTAMIRA CAVE

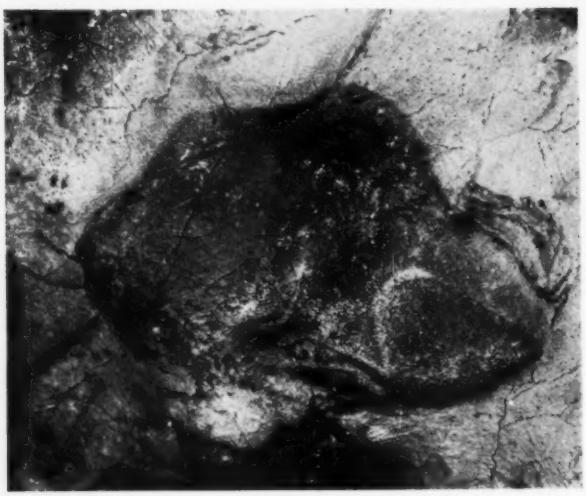
This shows the monument erected to Marcelino S. de Sautuola, the discoverer of the prehistoric paintings within



OUTLINE FIGURES ON THE CEILING OF THE ALTAMIRA CAVERN
These frescoes were discovered by Sautuola in 1879, and were the first examples of palæolithic mural art recognized as the work of primitive man

Awls and fine needles were made from antler, while pierced shells and teeth served for ornaments, as did thin rectangular ivory plates with incised and perforated edges. In addition, the inhabitants collected succinite (amber or amber-colored garnet), fossils, and rock crystals, as well as paintstuffs, including ochre, red iron oxide, and marl. The latter group consists partly of raw fragments, such as were ground and liquefied with animal fat or blood serum, and partly of real pointed "drawing pencils." These materials served chiefly for the execution of the numerous wall paintings, which reached their highest perfection during the Magdalenian period.

The uppermost and last stratum contains a rich early Magdalenian culture phase. From it have been taken several of the so-called *batons de commandement* or ceremonial wands; also shoulder blades of the stag with incised animal representations; while harpoons, so characteristic of the late half of the Magdalenian stage, are absent. At this time the cave suffered a fateful catastrophe. The rock roof of the entrance hall collapsed, its ruins so completely blocking access to



POLYCHROME PAINTING OF BISON
The crouched or trussed up attitude of the animal is due mainly to the fact that the body outline has been made to conform to the outline of an excrescence on the cave ceiling. Only the horns and tail are painted on the ceiling proper

Photograph by Prof. H. Obermaier, 1928

the interior gallery proper that no one could even suspect its existence. Thus the cave remained sealed up for many thousands of years, and during this time the Ice Age wall paintings slumbered in eternal night—a fortunate circumstance, for to it we owe their exceptionally excellent state of preservation.

The hour of rediscovery did not strike until the year 1868. A huntsman's dog lost his way among the crevices between some of the rocks. His rescue necessitated the removal of several large bowlders, and in this way the old entrance was again laid bare and made serviceable. Un-

Photograph by Prof. H. Obermaier, 1928

A FRESCO AT ALTAMIRA

Depicting the head of *Bos primigenius* in black, and other partially superimposed representations of animals

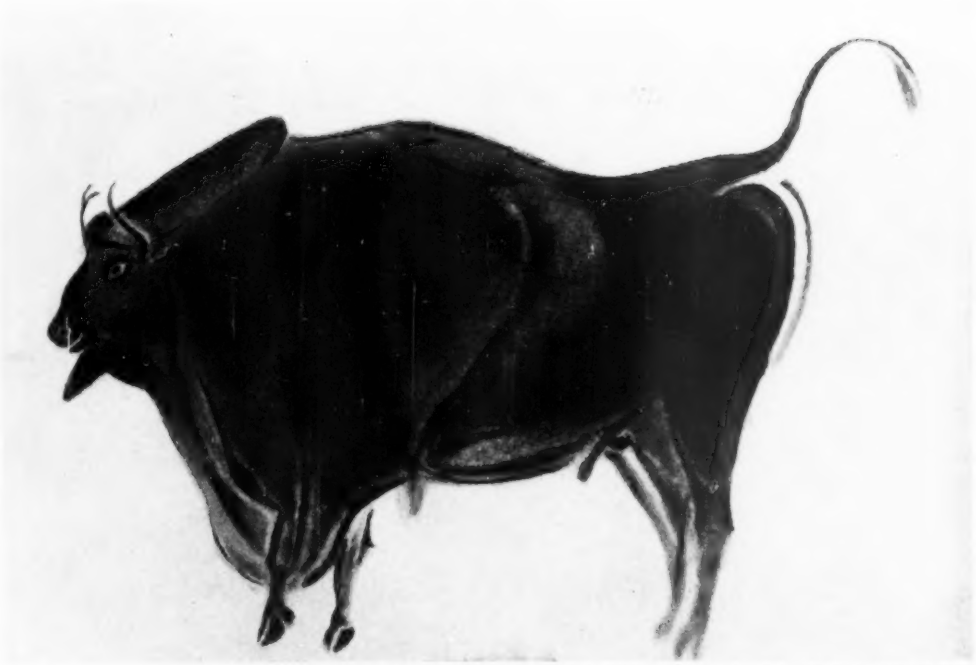
Photograph by Prof. H. Obermaier, 1928

THE PICTURE GALLERY IN ALTAMIRA CAVE

A view from the entrance, looking toward the left rear corner (Professor Obermaier at the right). The paintings occur on the ceiling of the cave and the visible rock projections have been utilized occasionally by the ancient artists to give the effect of high-relief sculpture to the animal forms represented

A HORSE SUPERIMPOSED OVER A HIND
Reproduction in a mural series in the American Museum of a mural fresco from the ceiling at Altamira cavern. The figure of the horse is painted in red ochre outlined with black manganese, and is more recent than that of the hind

ONE OF THE BISON FRESCOES
A polychrome bison in relief in the Altamira cavern. From a photograph by the author taken in 1928

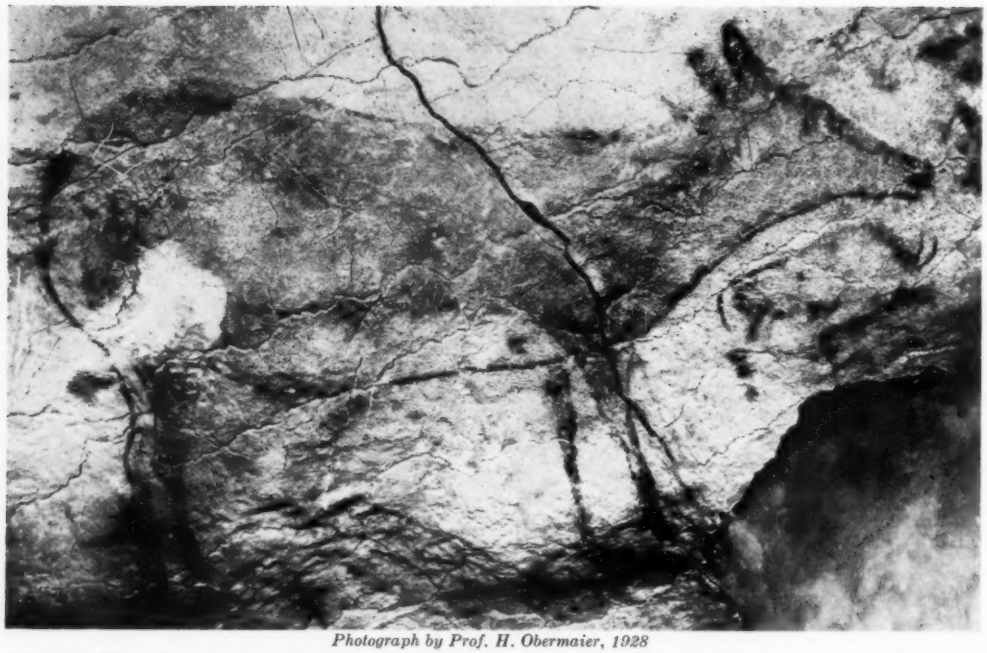


THE RESTORATION BY BREUIL

The best preserved polychrome painting of a bison in Altamira cavern. This illustration is after the copy of the original painting by L'Abbé H. Breuil; the illustration on the right is from a photograph by the author taken in 1928

THE ORIGINAL FRESCOE

This is one of the figures in which two techniques have been employed—parts of the bison are engraved, and the entire figure is painted



Photograph by Prof. H. Obermaier, 1928

(*Above*) The deer is outlined in black and the body portions stained red. Length of deer 2.20 m.

Painting of Female Deer

Note the small, black-painted bison beneath the head of the deer. (*Left*) From a restoration by L'Abbé H. Breuil

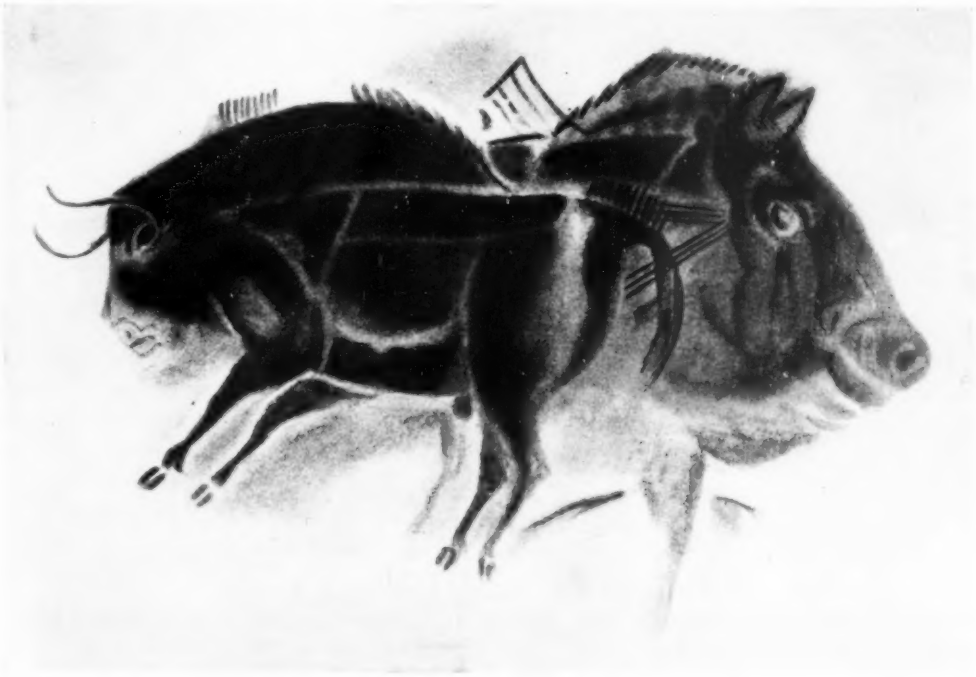
doubtedly, too, at about this time the most important part of the cave, namely, the picture gallery with its unique polychrome frescoes and engravings—situated about thirty yards from the entrance—barely escaped complete destruction. As I have ascertained from some of the oldest residents, and later proved by the discovery of numerous drilled blasting holes, a stone quarry was opened almost directly above the subterranean art chamber and exploitation carried on with a liberal use of explosives. In this way not only was the original stability of the painted ceiling impaired, but the roof as a whole, only a few meters thick, was everywhere shaken, occasioning dangerous cracks and fissures through which surface waters could trickle in abnormal quantities. As a preventive measure, in 1926 we waterproofed the outer surface of the roof portion concerned with a covering of cement, and in addition sprayed cement into the cracks of the limestone itself.

After the reopening of the cave, no one at first paid any particular attention to it, owing to the chaotic condition of the entrance. Not until 1875 were diluvial traces of occupation discovered there by the Santander archæologist, Marcelino S. Sautuola (1831–1888); and in 1879 his little daughter observed, deeper in the cave and to the left of the main vestibule, the rock paintings, the age and importance of which Sautuola instantly recognized

and subsequently defended against the opinions of critics and skeptics. Unfortunately, this abode of art was not at first given the needed protection. Admission to the very low-ceilinged "picture gallery" was for many years free and unhindered, and even after the cave was closed and guidance entrusted to a plain countryman of Santillana, the supervision of visitors was by no means adequate.

In 1902, the noted savants Emile Cartailhac and Henri Breuil undertook the scientific study and ultimate reproduction of both the wall and ceiling paintings, giving us as a result the magnificent work, *La Caverne d'Altamira a Santillane, près Santander, Espagne* (Monaco, 1906), now long out of print. In the meantime, I have myself during 1928 completed a systematic photographic record of the pictures, examples of which accompany the present sketch.

When, in the course of my excavations of 1925, at a point near the entrance, a new collapse of the ceiling threatened, which also endangered the great picture gallery, there came to the rescue the high-minded Duke of Alba, who had already won well-deserved esteem by his endeavors on behalf of Spain's scientific treasures. Through the efforts of a Protective Committee, organized under his leadership, the endangered portions of the roof were consolidated without impairing the character of the grotto. At the same time, convenient electrically lighted walks were laid out in the cave proper; and the Picture Gallery —called by J. Dechelette the Sistine Chapel of Ice Age art—in particular was equipped with ingeniously placed reflectors, greatly facilitating the appreciation of the art works. A house, built in the local style next to the cave, shelters the



SUPERIMPOSED PAINTINGS

A complicated panel from the paintings in Altamira Cavern, showing in superimposition an ox, boar, and a horse, as well as undecipherable elements. After Breuil

guardian as well as a small museum dedicated exclusively to Altamira discoveries.

In order conveniently to connect the cave with Santillana del Mar, there was built during the summer of 1928 an automobile road. The required rock material was procured from a quarry specially opened for the purpose about a hundred meters distant from the famous picture cave. This led to the discovery of a new grotto, which is remarkable for the extraordinary beauty and unmutilated condition of its numerous stalactitic formations. Whether archæological remains lie buried under the deep débris deposit at the former entrance I am not at present able to say. On one account do I wish, in view of my recently completed precise investigations, to bring up in this connection a human skeleton found within the cave, lying freely extended on a rock ledge without cultural accompaniments of any kind. The skeleton is, judging by its position and state of preservation, relatively recent, although certainly of prehistoric date. It is now preserved in the Altamira museum.

Photograph by Prof. H. Obermaier, 1928

POLYCHROME PAINTING OF A BISON

Done on the flat ceiling proper and therefore giving a lifelike representation of the animal. Length, 1.28 meters

Drawn by Arthur A. Jansson

Driving ducks into a trap with a returning boomerang

THE AUSTRALIAN BOOMERANG

The Two Types of Throwing Sticks Used by the Natives of the Island Continent. The Rarity of the Returning Boomerang, and a Report of How this Unusual Weapon is Sometimes Used

By EDGAR R. WAITE
Former Director, South Australian Museum, Adelaide

ACCOUNTS of the peculiarities of the boomerang and its faculty of returning can be found in innumerable works dealing with Australia or its aborigines, but the use to which it may be put is a subject that seems to have been consistently avoided. One must conjecture that any utilitarian employment of the weapon is a feature unknown to the writers. I have certainly not previously heard of the use of the returning boomerang in hunting ducks as herein described.

It is commonly believed, even in Australia, that all boomerangs, when properly thrown, will circle in the air and return to the feet of the thrower. This, however, is true of relatively few, and these are of a special type, known as come-back or returning boomerangs.

All boomerangs are broad in relation to their thickness, and are more or less flat on the under side and slightly arched on the upper. The long fighting or hunting type is only moderately curved, and, when sent on its course with a spinning or rotating motion, covers an effective horizontal area equal to its length, with each rotation, much as does the bolas of the South American Indians or as did the chain shot of a hundred years ago. A straight stick thrown at a man or kangaroo might, going lengthwise, just miss its objective, whereas a gyrating boomerang, taking a similar course, might easily cripple the man or break

the legs of the animal. Such a weapon can be hurled 600 or 700 feet.

The returning boomerang is much shorter, seldom more than two feet in length. It is rather sharply bent, forming an elbow, and its plane is twisted so that it will not lie evenly on a table. As held by a right-handed man, the concave side is toward the body, and the inner forward edge and the outer hinder edge are raised so that when thrown, it ascends, in passing through the air, from right to left, and, forming one or more spirals, gradually falls as its impetus lessens, its speed again increasing as it approaches the earth. It strikes the ground with considerable force, often at or quite close to the feet of the thrower. Considerable agility is sometimes necessary to avoid its too accurate return.

This form of boomerang has two apparent motions in addition to those of rising and falling; it has its own extremely rapid rotation which, like the vanes of an aëroplane, sustains it in the air; it also has the slower traveling movement which carries it more or less horizontally through space.

Scissors, as ordinarily constructed, naturally cannot be used by left-handed people and, similarly, a left-handed thrower cannot use a normally right handed boomerang; weapons with reversed inclination are known, and indicate use by left-handed throwers. Since boomerang throwers, who exhibit their skill in cities or at fairs, invariably choose returning implements, it is not unreasonably supposed that, as above stated, this home-coming quality is a feature of all boomerangs. For this reason it has been presumed that the boomerang is a toy, or that the returning feature is a convenient quality designed to assist recovery of a valuable object in case the quarry has been missed. If a boomerang hits any object during the course of its flight it obviously cannot return to the thrower. I have never heard of an aborigine attempting to hit an individual object with a returning boomerang and I doubt if it could be done. It may possibly be thrown at a flock of feeding parrots or drinking cockatoos at short range, but I presume that a small hunting boomerang would be preferred for this purpose.

The following account of the employment of returning boomerangs was related to me by an old native living on the banks of the Murray River, but it refers to byegone times before white men had appeared and drained the swamps, built locks, ousted the original inhabitants, both man and beast, and otherwise changed the conditions of the country.

This special use of the returning boomerang refers to a method of netting ducks and may perhaps be best explained in conjunction with the drawing at the heading of this article.

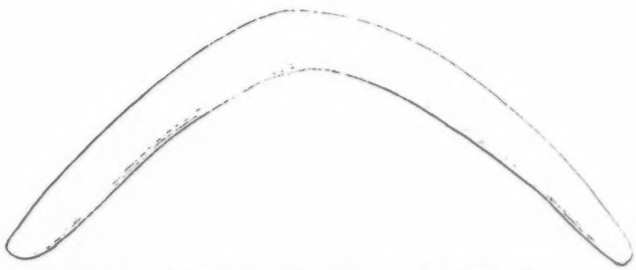
A stream entering or flowing from the *billabong*, or water hole, is previously netted over, the netting material being concealed with green boughs, rushes, etc.

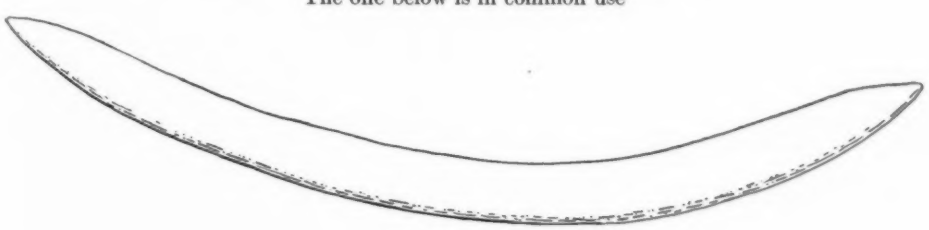
A flock of ducks has, let us say, settled on the *billabong* or water hole. By careful manœuvring on the part of hidden natives who take up strategic situations, the birds are induced to move to the position in which they are pictured. In order to effect this, the men may wade or swim under concealment of tufts of greenery held in the mouth, or the result may be attained by movements of bushes or reeds by natives distributed along the banks,—such movements being sufficient

to disturb without actually alarming the birds. They are gently moved as far along the stream as possible, but as soon as they become unduly suspicious and rise to return to the middle of the water hole, as is their wont, natives concealed behind bushes fling their boomerangs into the air, and these, circling above and behind the ducks and threatening danger, as from a hawk for example, cause them to descend and rush helterskelter up stream and under the netting, where they are trapped.

The application to duck catching may conceivably be extended to the taking of small game, the boomerang being first thrown and, by arresting or changing the course of the quarry, bring it within reach of the spear or hunting boomerang with which it would be attacked. Such employment is, however, conjectural, only.

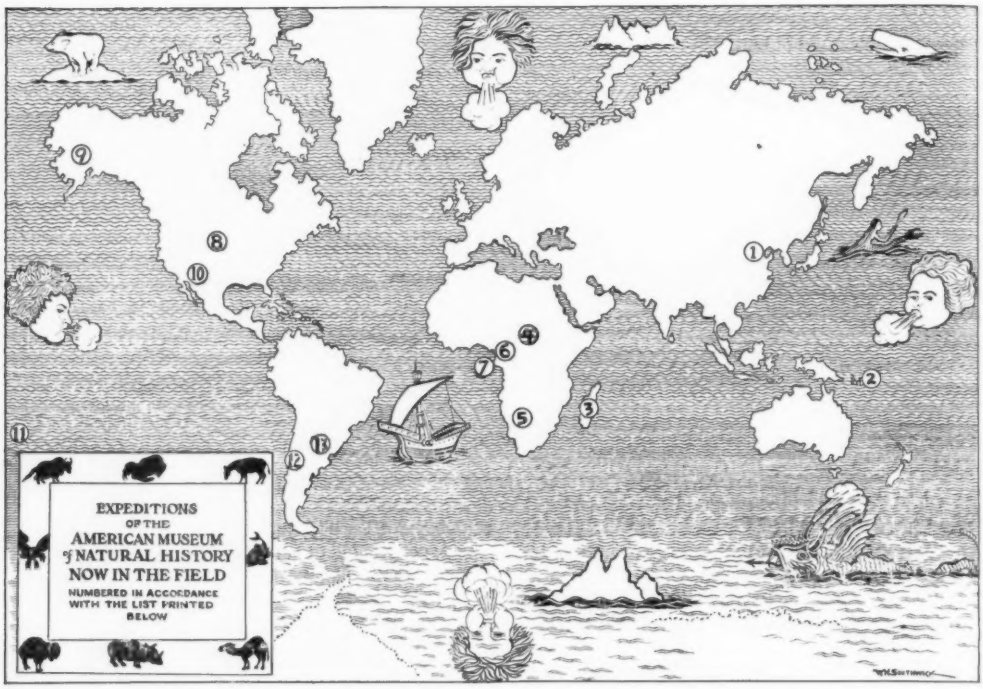
Weapons approximating the type of the fighting boomerang are known from ancient Egypt and India, but the returning boomerang appears to have originated in Australia and to be unknown elswwhere. It is not found, as far as I am aware, in waterless regions, such as parts of Central Australia. Whether first used as a toy and its utilitarian properties discovered later, or *vice versa*, will never be known.





TWO FORMS OF AUSTRALIAN BOOMERANGS

Contrary to popular belief, most boomerangs, when thrown, do not tend to return to the vicinity of the thrower. The boomerang pictured below is of the non-returning type, being only a very effective "throw stick." The more sharply curved type shown above does curve while in the air, and can be made to fly in a great curve, bringing it back more or less to the position of the thrower. This type, however, is rarely used by the Australian natives who developed it. The one below is in common use



1. Central Asiatic; 2. Whitney South Sea, Solomon Islands, for birds; 3. Madagascar, for birds, mammals, and fossils; 4. Chapin, Congo, for birds; 5. Vernay, to Africa, for mammals; 6. Columbia University-American Museum, to Africa, for anatomical study; 7. Thorne-Correia, Gulf of Guinea, for birds; 8. Frick-Falkenbach, Nebraska, for fossils; 9. Kaisen, Alaska, for fossils; 10. Frick-Rak, New Mexico, for fossils; 11. Shapiro, race mixture studies in Hawaii; 12. Olson, South America, archæological reconnaissance; 13. Naumburg-Kaempfer, Southeastern Brazil, for birds

AMERICAN MUSEUM EXPEDITIONS

EDITED BY A. KATHERINE BERGER

It is the purpose of this department to keep readers of NATURAL HISTORY *informed as to the latest news of the Museum expeditions in the field at the time the magazine goes to press. In many instances, however, the sources of information are so distant that it is not possible to include up-to-date data*

THE CENTRAL ASIATIC EXPEDITIONS.—A letter from Roy Chapman Andrews dated May 19 states that equipment is already *en route* to Mongolia and the expedition cars are in Kalgan. All permits both from Nanking and the Yen Hsi Shan government have been obtained, and the members of the expedition are ready to start the moment Doctor Teilhard and Doctor Young of the Geological Survey of China return from Manchuria on May 24.

RACIAL SURVEY OF HAWAII.—Dr. Harry L. Shapiro left New York early in July for Hawaii. He will spend the summer months there taking charge of a program of research in race mixture. This work will include particularly a study of Chinese-Hawaiian crosses, and a genetic study of the inhabitants from an anthropological point of view. He also intends to do some physiological work and make some physiological investigations. Doctor Shapiro is taking as an assistant William A. Lesser of the staff of the Presbyterian Hospital. Mr. Lesser will remain in Hawaii for two years after Doctor Shapiro's return, to carry on the project which Doctor Shapiro will direct from New York.

EXTINCT MAMMALS.—Four field parties for the search of remains of extinct Quaternary and late Tertiary mammals are being continued along the lines of previous years.

Mr. Peter Kaisen, with an assistant from the staff of President Bunnell of the College of Alaska, through the generous cooperation of the officers of the U. S. Smelting, Refining and Mining Co., is for the second season following up the vast stripping and dredging operations in the Fairbanks gold fields of Alaska. Mr. Kaisen, who has been with the American Museum more than thirty years, writes:

I have tried several kinds of transportation in fossil hunting but flying is the fastest and the easiest riding of all. . . . I never thought that I would go after fossils that way. I was at Livingood four days (50 miles northwest of Fairbanks). . . . We secured a sheep's skull . . . small goat skull . . . part of a musk-ox skull, complete bison skull and Carnivore skull . . . etc., which I brought back to the college by æroplane. . . . The Alaska Airways very kindly gave us, in consideration of our particular work, a special rate of ten cents a pound which is very little more than the rate by the older means of transportation. . . . The mine interests, including Mrs. Hudson at the Hudson Mine and Mr. Douglas, are taking the greatest care to save all the bones uncovered. It was Mr. Douglas who sent the college the great male Mammoth skull. . . . It is slow picking in the Fairbanks district at the present time but they will soon open up again in the vicinity of the bone pocket at Cleary Creek. They have started also on certain deep muck where the miners tell of having dug out a lot of bones a few years ago, and where I believe we can expect a pocket sooner or later. . . .

A THIRD partial season in the Quaternary deposits in the vicinity of Hay Springs, Nebraska, is being carried on by Mr. Charles Falkenbach who obtained there a year ago a record sized skull and jaws of the great extinct bear-creature, *Arctodus nebrascensis*.

FOR the eighth summer season Mr. Joseph Rak has transferred his parties' hunt for extinct mammals of the Miocene and Pliocene from the Mohave Desert, California, to New Mexico. It is to Mr. Rak's painstaking investigations that we owe the great majority of our most important finds of the past many years. Mr. Rak himself has been incapacitated for some weeks by an abscessed foot.

AN unusually fine skull of a huge species of the extinct wolf, *Amphicyon*, has just been received from Mr. M. F. Skinner, who is operating for the fourth season in the vicinity of Ainsworth, Nebraska.

THE MORDEN-GRAVES EXPEDITION.—Two shipments have now arrived at the American Museum from this expedition. The first one comprises 150 birds and mammals from the Russian steppes Kazakstan, Central Asia, including the much-prized saiga antelopes. No less than ten species of the mammals are new to the American Museum collections, and among the birds a black lark and a grouse have not only never before been represented in the Museum's collections, but are reputed to be quite rare.

The second shipment included 200 birds and mammals from the Amur River region in Eastern Siberia, together with the three fine specimens of long-haired Siberian tiger. Two leopards collected in the vicinity of Vladivostock are of interest because of their unusually long, warm coats. Other animals represented are musk deer, wild boar, a fine series of yellow mink shrews, and rodents. Among the birds worthy of note is a series of Siberian woodpecker. These are all new and highly prized additions to the Museum collections.

The story of the Morden-Graves Expedition will appear in a later issue of NATURAL HISTORY.

CHAPIN CONGO EXPEDITION.—Dr. James P. Chapin, associate curator of birds of the eastern hemisphere at the American Museum, is now on a collecting trip in the Belgian Congo, which is made possible through a fund established by Mrs. Dwight Arven Jones. Doctor Chapin attended the Seventh International Ornithological Congress at Amsterdam with Dr. Frank M. Chapman, and from there went to Brussels to complete arrangements for his journey to the Belgian Congo. A letter from him dated June 24 stated that through the Belgian authorities he had been supplied with credentials that would greatly facilitate his work, and that he expected to sail from Antwerp the following day.

In Brussels, Doctor Chapin was joined by Franklin Edson 3d, a representative of the department of mammalogy at the American Museum, who had volunteered to assist him. The material collected by Doctor Chapin and Mr. Edson will make possible a group showing the bird life of an African tropical forest and will be a companion group to one depicting the bird life of the plains.

THE VERNAY-LANG KALAHARI EXPEDITION.—On April 29 Mr. Arthur S. Vernay cabled that his expedition had successfully traversed the center of the Kalahari Desert with important results, and that they were proceeding to Ngamiland. On June 15 another cablegram announced that the third stage of the expedition had also proved successful. The party is planning to return to Pretoria via northern Kalahari and Makarikari.

ARCHÆOLOGICAL RECONNAISSANCE IN COLORADO AND WYOMING.—Several years ago, in the course of palæontological work at the so-called bison quarry at Folsom, New Mexico, there were uncovered some peculiarly shaped stone points in association with bison bones, implements of a type not previously observed in the United States, except as sporadic finds. This association with bison bones suggested the existence of an early hunting culture, so in 1928 the department of anthropology of the American Museum, made a survey of the near-by Johnson's Mesa to discover, if possible, further traces of human occupation. This survey revealed plainly that Johnson's Mesa was not so occupied. It became necessary, therefore, to extend the search for these evidences of occupation farther afield, and in 1929, under the patronage of Mrs Payne Whitney, Mr. R. M. Snodgrasse, a special field assistant, spent the summer in an archæological

reconnaissance in the district around Yuma, Colorado. Mr. Snodgrasse will spend the field season of 1930 in a further extension of this reconnaissance to Colorado and Wyoming.

REPTILES AND AMPHIBIANS FROM CUBA.—Mr. Arthur Greenhall and Mr. J. A. Weber, who have been exploring in Cuba on expeditions financed by themselves, have recently sent the department of herpetology and experimental biology some important additions to its collections of reptiles and amphibians. Among these rarities are some large Anolis and the Cuban bullfrog.

INDIAN STUDIES.—The cultural position of Indian women will be the subject of study of Dr. Margaret Mead, assistant curator of ethnology at the American Museum, who is spending the summer months on the Indian Reservations at Omaha, Nebraska.

NOTES

ASTRONOMY

TWO ASTRONOMICAL PAINTINGS PRESENTED TO THE AMERICAN MUSEUM.—Two large oil paintings of the planet Mars, imaginary views, one from the inner moon, Phobos, and the other from the outer moon, Diemos, have been presented to the American Museum by Mr. Howard Russell Butler of Princeton. Mr. Butler was adviser to the architects in planning the Museum's hall of astronomy, and he has been for a number of years a member of the advisory committee of the department of the Museum. In recognition of his splendid gift and of Mr. Butler's services, the Trustees have elected him a Patron of the American Museum.

CONSERVATION

A WORLD MOVEMENT FOR THE PRESERVATION OF ANIMALS.—In view of the appallingly rapid extermination of wild mammalian life, it is encouraging to note the activities in connection with a world movement for the preservation of animals, chiefly mammals, as evidenced by the present work of the Society for the Preservation of the Fauna of the British Empire and the International Wild Life Committee. Just as acute and immediate is the problem of conserving whales and seals and other marine mammals. How long these rapidly diminishing herds will survive depends upon the speed with which protection is granted them through international regulations.

To be most valuable such regulations necessarily should be based upon careful investigations for the purpose of gathering all possible information on these marine mammals and on the factors which influence them. As these take time, the need for immediate action is all the more urgent.

The League of Nations has taken up the matter with great seriousness, and on April 3 held a session devoted to the question of the need for conserving the supply of whales. At this session there were present as advisors, representatives from a number of nations.

The Council for the Conservation of Whales and Other Marine Mammals, under the auspices of the American Society of Mammalogists, sent as the American representative Dr. Remington Kellogg, chairman of the Technical Committee of the Council. Doctor Kellogg reported that the experts agreed unanimously that it was possible to assist the whaling industry by international convention, and proceeded to consider what provisions could at present be recommended for inclusion in such a convention. It was recommended that there should be

Immediate and absolute protection of such species of whales as are in serious danger of extermination.
Protection of females nursing young.
Compulsory utilization of entire carcass.
Formation of an international commission to determine ways and means.

Doctor Kellogg considers that much good was accomplished at the session and that it should be productive of valuable results.

At the last annual meeting of the New York Zoological Society, Dr. Charles H. Townsend, director of the New York Aquarium, described the extent and operation of the whaling industry as it exists today, and contrasted the present-day methods with those of the Nineteenth Century. A resumé of Doctor Townsend's talk is given in another note in this issue of NATURAL HISTORY.

The rapid development of the British Dependencies of the Falkland Islands since 1904–05 has raised grave fears that Antarctic whaling by modern methods would soon come to an end because of the rapid depletion of the whales. Efforts were made by the British Government to control the industry by special regulations, but it was soon evident that more scientific knowledge was necessary. The problem was referred by the Secretary of State for the Colonies to an Interdepartmental Committee. As a result, in 1925 two vessels were sent to Antarctic waters to make an economic study of the whales and whaling grounds of the Dependencies.

The "Discovery Reports" issued by the Discovery Committee, Colonial Office, London, in 1929, on behalf of the Government of the Dependencies of the Falkland Islands, give a most interesting and informing account of the investigations, the ships, their equipment, the

methods used in research, and the marine biological station at South Georgia. The work is still in progress, and as fresh data is accumulated, presentation of results will proceed simultaneously.

The following very latest statistics received from Oslo, Norway, for the last four years, show the tremendous growth of the whale oil industry.

PRODUCTION OF WHALE OIL

Barrels of Whale Oil

793,790—1926–27
991,936—1927–28
1,540,200—1928–29
2,447,690—1929–30

The speed with which whale oil has been produced has glutted the market. American buyers, therefore, have two years' supply on hand, and will not purchase more except at greatly reduced prices.

It is estimated that the animals that remain will suffice for only two years more of whaling in the Antarctic—the last stronghold of the whales. This will be the end, unless something is done, and done quickly to preserve this last remnant from complete extermination.

THE VANISHING WHALE AND THE WHALING INDUSTRY.—The increasing drain on the stock of whales by the modern methods of whaling as contrasted with those of the Nineteenth Century was vividly set forth at the last annual meeting of the New York Zoological Society by Director C. H. Townsend, who is and for many years has been one of the foremost authorities in America on whales and other marine mammals. An excellent description by Director Townsend of what is now going on in the whaling industry, and of the efforts of conservationists to secure international regulations for its control, appears in the January–February, 1930, issue of the Bulletin of the Society.

The United States, once leader in the industry, no longer takes active part in it, says Doctor Townsend, save to a very limited extent in California and Alaska. Much of the information, therefore, comes from foreign sources.

The Whaling Committee of the International Council for the Exploration of the Sea, when discussing the subject of whale conservation early in 1930, felt strongly that "the enormous expansion of the whaling industry constitutes a real menace to the maintenance of the stock of whales, and if the expansion is continued at the present rate, there is real risk of these stocks being so reduced as to cause serious detriment to the industry."

Permanent measures of protection would be possible only after scientific researches have reached a definite conclusion, but temporary measures are strongly urged to include the prohibition of the killing of certain species of whales, principally right whales, the protection of cows with calves, immature whales, and the prohibition or restriction of the capture of whales in certain regions, notably in the tropics.

The Norwegian parliament has forbidden all Norwegian whalers to kill the right whale and all whale cows with calves. Whaling crews can no longer be paid according to the number of whales taken, and all parts of the animal containing oil must be used.

Today the methods by which the whaling industry is carried on are vastly more efficient than those in use in the Nineteenth Century. In those days only the slower moving whales, such as the sperm and the right whale, fell to the catch of the old-time whaler, but the present-day floating factories with their steam hunting boats and their enormously expensive equipment make possible the capture and disposition of the great blue whale, the finback, the humpback, the sei whale and others too speedy for open whale boats, and yield proportionately greater profits.

The larger vessels now being built are provided with slips through which all whales are pulled on board before being cut up. Some of the factory steamers already in use exceed more than 12,000 tons in size, and the "Kosmos" which recently began operations in the Ross Sea section exceeds 22,000 tons. It is accompanied by seven steam hunting boats and an airplane. There is a working deck for oil production and one for the preparation of fertilizer. Provision is also made for the canning of whale meat. Six or eight large blue whales a day, and more than twice as many of the smaller kinds, can usually be disposed of by the larger floating factories. The yield from the larger blue whales may be as much as seventy-five barrels of oil apiece, and from humpback and fin whales about half as much. The value of whale oil is greater than ever before, being worth about $26 a barrel. Soap-making industries purchase it in large quantities.

Whaling as now carried on is largely a Norwegian industry. The greater part of the catch is made in Antarctic waters, and amounts to about 70 per cent of the catch in all parts of the world. More than 20,000 whales have been killed annually in the Antarctic during recent years, and in addition to the shore stations at South Georgia and other Antarctic islands, during 1928–29, according to Director Townsend, there were eight floating factories. The catches made by the "Sir James Ross" and the "C. A. Larson" totaled 1306 whales and yielded 126,000 barrels of oil valued at more than $3,000,000.

Dispatches from Norway in August of 1929 announced that the most important preparations for the new season of Antarctic whaling ever recorded, namely a fleet of 190 steam hunting boats, 37 factory steamers, and 7 transport steamers are under way.

THE SOCIETY FOR THE PRESERVATION OF THE FAUNA OF THE BRITISH EMPIRE.—At a meeting held April 28, the executive committee of the Society for the Preservation of the Fauna of the Empire passed a formal resolution expressing its gratitude to the members of the American Committee for their splendid effort made on behalf of wild life conservation, which has resulted in substantial assistance at a moment when an extension of influence is essential.

DEL NORTE COAST STATE PARK.—Forever protected from defacement through its new status, Del Norte Coast State Park, a region nearly 2500 acres in extent, combining giant redwoods and seacoast scenery, henceforth is to be preserved for the people of California and the nation by the completion of the Del Norte Coast Project of the Save-the-Redwoods League and the California State Park Commission. Mr. J. C. Perry, councilor of the League and chairman of the committee having the project in hand, reported to the members and officers of the League that through private contributions, matched with funds from the State Park Board Issue, this area becomes a part of the California State Park System.

The Del Norte Coast Park is one of the four primary projects of the League. Those who have traveled California's Redwood Highway where it winds above the Pacific Ocean about ten miles south of Crescent City, Del Norte County, will remember this stand of giant redwoods. Its beauty is enhanced by the fact that in addition to the five miles of highway through the forest, the project includes more than seven miles of ocean frontage, the highway at times taking its course close to 1,000 feet above the shoreline. Many consider the stretch of highway in this new park area one of the most spectacular drives in the world.

Through the efforts of the Save-the-Redwoods League, redwood lands totaling 3,589 acres and representing a valuation of approximately $6,000,000 have been acquired since June, 1928.

EXPERIMENTAL BIOLOGY

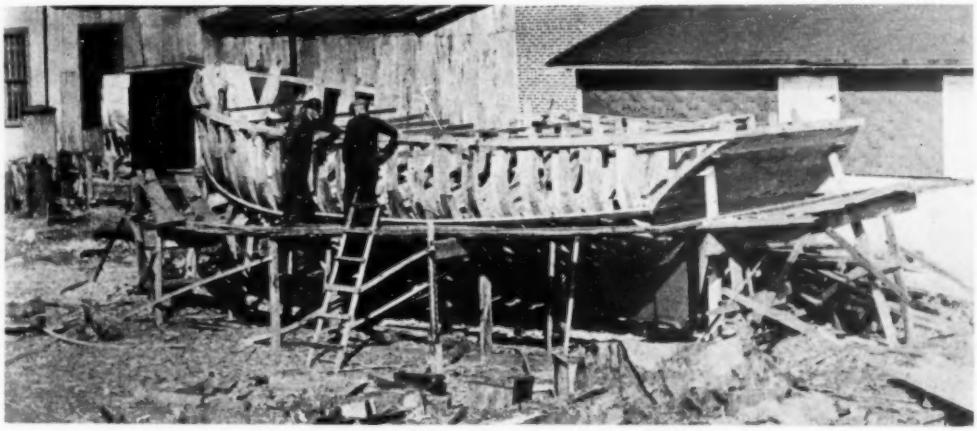
ARBOREAL SALAMANDERS OF KENTUCKY.—Mrs. S. H. Pope recently made a trip to Pine Mountain, Kentucky, where with the help of the boys of Pine Mountain Settlement School, she brought together a large collection of the rare arboreal salamander, *Aneides æneus*. These specimens were shipped alive to the American Museum laboratories of experimental biology, where their courtship is being studied under controlled conditions of the dark room. The courtship of no plethodontid salamander was known before the department began its studies. Many plenthodontids have extraordinary secondary sexual characteristics, such as elongated front teeth and peculiar glands scattered over the body of the male. The courtship of these salamanders turns out to be very complex and closely correlated with the peculiar modifications found in the males.

THE MOST PRIMITIVE OF LIVING TETRAPODS.—The primitive family of frogs includes only *Ascaphus* of the New World and *Liopelma* of New Zealand. For some years the department of experimental biology has been making both anatomical and experimental studies of *Ascaphus*. This year Mr. Phillips Putnam again went into the field to study and collect *Ascaphus* in its native brooks. The species lives in the Olympic Mountains, in streams flowing from glaciers. While the common frogs become inactive in water temperatures approaching freezing, *Ascaphus* revels in water flowing directly from the ice fields. The tadpole is extraordinarily modified for holding on to rocks in the swift water of glacial streams. Very little is known about the early development of the species. The department is planning to breed *Ascaphus* in the Museum laboratories under controlled conditions and to study its early development.

MAMMALS

ON THE EXTINCTION OF MAMMALS IN THE LORIAN SWAMP DURING THE DROUGHT OF 1928.—Captain Alexander T. Curle, writing from his present residence in British Somaliland, has contributed some very interesting notes on the terrible conditions in the Lorian Swamp during the drought of May, 1928. The Lorian Swamp is situated in the Northern Frontier Province of Kenya Colony, (Lat. 0° 58′ 03″; Long. 39° 49′ 16″) at an altitude of 691 feet and covers an area of about five by three miles. The River Uaso Nyiro runs into the Swamp, which is covered by dense papyrus grass over six feet in height, flooding it in normal season with about six inches of surface water and disappearing into the mud. In May, 1928, owing to the failure of the rains, the river discontinued its flow into the Swamp; only a series of isolated pools about eight or ten feet in width remained in the middle along the channel of the river. One pool about four feet below the level of the bank and con-

sisting of mud to a depth of three feet was practically a solid mass of hundreds of fish (Siluroids) many of which had died so that the odor was terrific. Another pool contained crocodiles, all small and living; still another was jammed with fish, and hippopotami packed closely together with their heads under the mud.



THE "BASILISK" UNDER CONSTRUCTION

The boat in which Mr. Gilbert C. Klingel will travel for a year and a half, and which is an exact replica of the famous "Spray"

One hippopotamus was driven out of the pool, tormented by the nibbling of the fish at a gash in its side. Farther down the Swamp natives had dug wells to a depth of twelve feet in the dry river bed and into one of these a small elephant had fallen and could not be removed. During the fortnight Captain Curle and his companions were in the region six elephants had died of thirst. They were small, as elephants go, somewhat over three-quarters grown. Other elephants, maddened by thirst, had killed a camel and some goats, while hundreds of elephants were seen daily in the Swamp searching for water. Most of these were small tuskers, the older animals having made the waterless trek across to the Tana River. A similar drought is reported to have occurred in 1912, but to have been not nearly so severe as the drought of 1928. H. F. O.

HERPETOLOGY

A NEW ALLIGATOR ON EXHIBITION.—Large alligators are today very rare because of the depredations of the skin hunters. The American Museum is, therefore, fortunate in being able to place on exhibition a full grown specimen of the American alligator recently presented by the New York Zoological Society. The specimen has been mounted by Mr. Walter Escherich in a very life-like position. It will replace the old alligator which has been on exhibition for some years in the Reptile Hall.

REPTILE AND AMPHIBIAN STUDY.—Small tropical islands are frequently rich in reptile life, and colonies of lizards are known to occur on various uninhabited islands. There are many problems connected with the organization of lizard colonies which have an important bearing on the social organization of higher groups of vertebrates. Mr. Gilbert C. Klingel, of Baltimore, Maryland, who has recently published an article in NATURAL HISTORY on his work in Haiti, is planning to continue his studies of the reptiles and amphibians in the West Indies and Central America, and for this purpose is building a vessel which will be an exact replica of the famous "Spray." The expedition will be under the auspices of the American Museum, and will leave New York late in the fall. A year and a half will be spent in the West Indies and along both coasts of Central America.

FISHES

A BASKING SHARK FOR THE AMERICAN MUSEUM.—The department of ichthyology has recently acquired a fine specimen of the basking shark *Cetorhinus maximus*. This fish became entangled in the gill net of Messrs. Carl Holgerson and Edwin Gustafson off Long Branch, New Jersey, on June 5. These men managed to get it ashore where it was preserved in the freezer of the Monmouth Beach Fish Company. News of this shark reached the Museum through the kindness of Mr. Morris Ranger of this city. Dr. E. W. Gudger went down on June 9 and

"THE HEAD OF A MARTINIQUE WOMAN"
By Malvina Hoffman
Presented to the American Museum by Lincoln Ellsworth

purchased it. On June 11 it was brought up by truck frozen solid as a log. While in this condition it was measured and photographed and a color sketch was made. On June 12 when it had thawed out, more photographs were taken, a plaster cast was made, the skin was removed and the head and mouth and gill structures preserved as a whole.

From the data and materials at hand it will be possible to make a fine mount for the Hall of Fishes. (The only mounted specimen at present on exhibition in the United States is in the Boston Society of Natural History). The head and attached gill parts will furnish material for study of the structures with which it feeds. It is called "bone shark" because it has whalebone—like horny gill rakers with which it sieves out the small crustacea and other food materials from the great volume of water passing into its cavernous mouth and out of its enormous gill slits. The specimen, a half grown female, measured 14 feet, 3 inches between perpendiculars.

HISTORY OF THE EARTH

MEDITERRANEAN LAND BRIDGES.—For a long time students of Pleistocene faunal distribution in southern Europe and northern Africa have assumed or claimed evidences of former land connections between the two continents both by way of Sicily and over what is now the Strait of Gibraltar. In the Journal of the Royal Anthropological Institute for Jan.-June, 1928, Miss Dorothea M. A. Bate published, among other items, a list of more than twenty-five mammal species found in a small Gibraltar cave associated with cultural and osseous remains of the Neanderthal man. Her conclusions are that "the evidence provided by both the mammalian and avian faunas indicates that there was *no* land connection at this point with the opposite African Coast in Mousterian times" (p. 92).

Recently a reprint was received from Prof. R. Vaufrey, of the Institut de Paleontologie Humaine, Paris, dealing at some length with the question of the supposed Tunis-Sicily-Italy isthmus. The article appears in the *Revue de Geographie Physique et de Geologie Dynamique* for December, 1929, and is entitled "La Question des Isthmes Mediterranéens Pleistocenes." The author's negative conclusions, given under three separate heads, may be rendered in translations as follows:

1. *Evidence of submarine geography.* Contrary to the conclusions accepted before the war from examination of the marine charts, the submersion of the continental shelf was not in itself sufficient—"at a depth of some ten or twelve meters"—to join Cap Bon of Tunis to Sicily. Figuring from the most recent soundings it is apparent that it would need a retreat of water of nearly 400 meters to enable one to pass dry shod from Tunis to Sicily.

2. *Evidence of archæology.* We have seen that man probably did not reach Sicily for the first time until the end of the Upper Paleolithic. The maps showing the distribution of industries, such as often figure in recent treatises, are therefore erroneous. Instead of a shaded area it is a blank which must be understood to exist throughout all Calabria to the south of the 40th degree of latitude and in Sicily, during all the Chellean and Mousterian. Opposite, on the African shore, there are no ancient industries in the north, from a line drawn from Bougie to Gafsa. Rare indeed are the traces of Upper Paleolithic industries, as I was able to prove in 1926 during my survey of this region. These facts are not favorable to the hypothesis of a Sicilian-Tunisian land bridge, which, if it had existed in the last interglacial epoch, must have been the ground for active faunal interchanges, especially marked by the passage of man.

3. *Evidence of paleontology.* There is therefore no evidence found either in Sicily or in Malta

of the Chellean, the Acheulean, or the Mousterian cultures. Accompanied by only a few other mammals, the hippopotami and fossil elephants are the sole masters of the isle; these animals came from Europe, not from Africa. These latter, caught in a cul-de-sac, barely continued existence up to a period probably contemporary with the beginning of the Upper Paleolithic and developed their dwarfed mutations, such as the pigmy elephant and hippopotamus. Had a Sicilian-Tunisian land connection existed, would they not have inevitably ebbed again to Africa? But no dwarf elephant has been found in Africa, for the *E. Melitensis* of Palikao is imaginary. On the contrary, the African fauna is easily distinguishable from that of the Pleistocene of Europe, and especially from that of Sicily, by the abundance of antelopes, gazelles, a few deer, camels, giraffes, and buffaloes. No single point of contact is possible between the two faunas, so different both in the number of species and in their affinities. It is through Syria, as evidenced by recent paleontological discoveries in Galilee, that the cryptogenic elements, namely the fossil mammals preserved in the caverns of Sicily and Malta have infiltrated with the north African Pleistocene fauna: deer, cervids, bears, cats, hyenas.—H. F. O.

ICELAND MILLENNIUM

AMERICAN EVERGREEN TREES PRESENTED TO ICELAND.—Dr. Clyde Fisher, of the American Museum of Natural History, sailed from New York on June 17 bound for Iceland on a mission for the New York Bird and Tree Club of which he is president. He will also visit Norway, Denmark, and Sweden, where he expects to take photographs for the educational work of the American Museum. Doctor Fisher took with him as a gift from the New York Bird and Tree Club to the people of Iceland several crates of small American evergreen trees, as well as the promise of seedlings to be sent in the coming fall and spring. These were presented at the millennial celebration of the founding of the government of Iceland, the oldest parliament in existence. This gift combines a gesture of international friendliness with the interesting horticultural experiment of trying to re-establish trees on this island that once grew forests.

INSECTS

OUTDOOR MUSEUM INSPECTION.—Dr. Frank E. Lutz, curator of insect life and outdoor education at the American Museum left the latter part of June for Yellowstone National Park. As a representative of the American Association of Museum's committee on outdoor museums, he will visit the nature trails and trailside museums connected with the National Park to give helpful advice regarding these projects. Doctor Lutz will also investigate the ecology of the hot springs.

HOFFMAN SCULPTURES

MUSEUM ACQUISITIONS.—Three striking sculptures by Malvina Hoffman have recently been acquired by the American Museum. Two of these, "The Head of a Martinique Woman" and "The Head of a Senegalese Soldier," were presented by Lincoln Ellsworth as a memorial to his sister, Mrs. Clare Ellsworth Prentice. They have been placed temporarily in the Hall of Minerals, but will be on permanent exhibit in the African Hall when it is completed.

The third sculpture entitled "The Coal Man," is especially remarkable for the fact that Belgium coal was the medium used. The coal was treated by a process which prevents the carbon from rubbing off and hardens the coal sufficiently to be handled by the sculptor. "The Coal Man" is now on view in the Hall of Geology.

Another example of Miss Hoffman's art which has been on exhibition in the Hall of Forestry at

"THE HEAD OF A SENEGALESE SOLDIER"
By Malvina Hoffman
Presented to the American Museum by Lincoln Ellsworth

the American Museum for ten years is a bust of John Muir. Miss Hoffman's sculptures have achieved for her a world-wide reputation, and the Museum is most fortunate to be recipient of these valuable gifts.

Miss Hoffman is now engaged on a series of racial groups for the Field Museum.

MEETINGS OF SOCIETIES

THE AMERICAN SOCIETY OF MAMMALOGISTS MEETS.—The convention of the American Society of Mammalogists, which met at the American Museum of Natural History from May 20 to 24, had the greatest attendance of any meeting in the Society's history. This was due in large measure to the widespread interest taken in the three symposia which occupied most of the program. These were on the conservation of predatory mammals, particularly the coyote; the gorilla and its place among the primates; and the zoological parks as centers for research.

The general program covered a wide field. The life histories of the chipmunk and the raccoon were detailed. The overcrowding of deer in Pennsylvania was discussed. Fine motion pictures of muskoxen, giant Alaskan brown bear, lions, gorillas, and other African animals were shown. One paper demonstrated the occurrence of two races of a single species of deer-mouse in one area. This was shown to be possible by reason of the different habitat preferences of the two races. An account was given of the testing of the strengths of various internal drives of the white rat, and it was shown that the maternal drive was stronger than all others. Another test, on the learning ability of kittens, demonstrated that there was a remarkable, though individually variable, degree of ability among them.

The gorilla was discussed by many of the country's authorities. Its behavior both in the forest and in the laboratory, as well as many parts of its anatomy were thoroughly described, and considered in the light of the gorillas' probable relation to man.

In Defense of Coyotes

The chief interest in the meeting centered around conservation. The United States Biological Survey has for fifteen years been at work attempting to control the coyote, which occasionally makes serious inroads upon young stock on the western ranges. While it is universally agreed that control measures are necessary, there is well-founded criticism of the results obtained by the present method of distributing poisoned baits with the result that all flesh-eating fur bearers are killed without discrimination. It also has yet to be demonstrated that, in general, the coyote does more harm than good, for the animal feeds very generally on rabbits and other rodents which the government must in turn poison when their populations are unchecked by natural enemies. In expression of its conviction that the bill now before Congress to increase appropriations for predatory animal control without adequate research to establish the desirability of such control, the Society passed the following Resolution:

Whereas: The American Society of Mammalogists, a group of over 1000 naturalists, is vitally concerned with the welfare and preservation, of all kinds of wild mammals; and

Whereas: We heartily approve the stated policy of the Bureau of Biological Survey of the United States Department of Agriculture not to carry control measures to the point of extermination, and hope that field practice will conform strictly to this policy; and

Whereas; Nevertheless, many valuable mammals have been destroyed by the methods of control now being used by the Biological Survey and coöperating agencies; therefore,

BE IT RESOLVED: That campaigns for the destruction of predatory mammals should be conducted only in those localities where scientific study has shown that such control measures are necessary for the general public welfare and are not solely for the benefit of some special interest; and

BE IT RESOLVED: That the use of poison for the control of predatory mammals should be abandoned, except in case of absolute necessity, such as might arise during the outbreak of rabies in coyotes.

Alaskan Brown Bears Threatened

The largest of living land carnivores are the brown bears of Alaska. Protection previously accorded them has recently been removed, with the result that their extermination must soon follow if protection over at least part of their range is not immediately restored. To furnish a sanctuary where the bears might continue without danger to man, the Society urges that certain little-inhabited islands be set aside for the purpose. The following two Resolutions urging the protection of the brown bear were passed:

Whereas: The natural habitats of the grizzly and brown bears of Alaska are now being claimed by Civilization, which threatens their complete extermination; and,

Whereas; The islands of Admiralty and Chichagof, located in Southeastern Alaska, are now populated by grizzly and brown bears of several species, and are ideally situated both by reason of location, size, and physical topography to be permanent sanctuaries for these animals; therefore,

BE IT RESOLVED: That the proper governmental authorities be urged to set aside the said islands, Admiralty and Chichagof, as inviolate sanctuaries for the Alaskan brown bear and grizzly bear in order that these two characteristic American animals may be protected and preserved.

Whereas: The Alaska Game Commission by amendments to the Alaska Game Law, which will become effective July 1, 1930, have removed all restrictions on the killing of grizzly and brown bears by residents, except in several comparatively small areas; and,

Whereas: The removal of these restrictions will endanger the existence of these species; and,

Whereas; The grizzly bear is fast becoming extinct in the United States and has been lessened greatly in numbers in Alaska in recent years by intensive hunting; therefore,

BE IT RESOLVED: That the American Society of Mammalogists deplores the action of the Alaska Game Commission in removing restrictions on the killing of grizzly and brown bears by residents of Alaska; and,

BE IT FURTHER RESOLVED: That copies of this resolution be sent to the Members of Congress and the Senate; to the Chief of the United States Biological Survey; and to the Alaska Game Commission, urging that steps be promptly taken to the end that the protection now accorded these animals be continued.

Those interested in these conservation measures should communicate with Mr. John Holzworth, White Plains, N. Y. —ROBERT T. HATT.

AT THE AMERICAN ASSOCIATION OF MUSEUMS meeting held at Buffalo, June 4–8, a new scientific section was established under the chairmanship of Dr. Roy Waldo Miner, curator of lower invertebrates, American Museum, and with Director Charles J. Fish of the Buffalo Museum of Science as section secretary. The purpose of the section is to organize programs of particular interest to scientific curators and those associated with them in various museums.

This newly formed section was well attended and received an enthusiastic backing. The following program was presented:

I. Introduction by Doctor Miner.
II. Making Scientific Collections.
"Field Work for a Scientific Museum" by Doctor Fish.
III. Analyzing Scientific Collections.
"Problems of the Study of Scientific Material in the Museum," by Dr. Waldo L. Schmitt of the U. S. National Museum.
IV. Utilizing the Scientific Collections.
"The Use of Living Material in the Museum," by Dr. Frank E. Lutz of the American Museum of Natural History.

These papers were discussed at length.

THE THIRTEENTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS was held in the American Museum, May 20–21. Twenty papers were read by members of the Society, and eighteen demonstrations were presented. Among the special features was a symposium on The Flight of Fishes, and a discussion of the Origin of the West Indian Fauna. Some very unusual motion pictures were shown by Mr. Gilbert C. Klingel and Mrs. Grace Olive Wiley. A large part of the program was given by the staff of the departments of fishes and reptiles of the American Museum.

MINERALS

ICELAND MILLENNIUM 930–1930.—June 26, 1930, commemorates the one-thousandth anniversary of the establishment of the Althing, the national assembly of Iceland. The department of mineralogy of the American Museum gave recognition in its exhibition hall of this millennium by attaching small paper reproductions of the flag of Iceland to the mounts of the 40 mineral specimens from that island, which included zeolitic minerals and the Iceland spar variety of calcite. A placard calling attention to the marked Iceland minerals was placed in a prominent position in the Morgan Gem Hall.

SCIENCE OF MAN

MEXICAN ARCHÆOLOGY.—The excavations at Ticoman, Federal District, Mexico, carried on by Dr. George C. Vaillant of the division of anthropology of the American Museum, from November, 1929, to March, 1930, yielded additional data for the early cultures in the Valley of Mexico. At Zacatenco the previous year, three chronological phases were established, of which the latest, Late Zacatenco, seemed to represent a strong intrusive influence. At Ticoman this late period of Zacatenco becomes the earlier of two phases closely related ethnically but showing increased artistic and technical development chronologically. As yet, however, no link with the great Toltec pyramids of San Juan, Teotihuacan, has been found. A small series of skulls examined hastily by Dr. H. L. Shapiro of the American Museum showed traits indicative of an actual shift in population between the inhabitants of Ticoman and those of the early two phases of Zacatenco, substantiating the evidence of the artifacts. Information was collected that the level of the lake on which Zacatenco and Ticoman are situated was much lower in the Early Zacatenco Period, but owing to some blocking of the outlets in the Middle Period, the rise in the lake drove the population up the hills along the shores.

S. BRINKERHOFF THORNE

ON June 3 last, Mr. S. Brinckerhoff Thorne, member of the Board of Trustees of the American Museum since January, 1928, and Secretary of the Museum since January, 1930, died at New York in his 57th year.

His wise counsel, his sincere enthusiasm for the Museum and its work, will be greatly missed by his colleagues.

At a memorial meeting of the Board of Trustees, President Henry Fairfield Osborn paid the following tribute to Mr. Thorne:

The sudden death on June 3, 1930, of Mr. S. Brinckerhoff Thorne, recently elected Secretary of The American Museum of Natural History to succeed the late Mr. Percy R. Pyne, is an inexpressibly sad blow to the institution. For his deep interest in the welfare and progress of the Museum united with his many endearing personal qualities he was admired and esteemed by all his fellow Trustees as well as by an ever-widening circle of friends in this community. Since he came on the Board some years ago his especial interests have been in the Department of Birds in support of his college mate and friend, Doctor Leonard C. Sanford of New Haven. He contributed most generously to several of the bird collecting expeditions in the far east and was rapidly becoming one of the most influential and useful members of our Board.

Personally I was greatly attached to him and to his family with which I have been associated for three generations in the American Museum, in the Zoölogical Park and in other philanthropic enterprises. I also vividly recall him when as a brilliant end rusher of the Yale University eleven, he was a widely-known and honored figure in the college athletic world. It seems very hard that we should lose from our none too large circle of public-spirited citizens such a man as this in the very prime of life and in the high tide of usefulness and unselfish devotion to the public welfare.

It was resolved that this tribute be adopted and incorporated in the minutes of the Trustees as an expression of their high esteem and affection for their late colleague.

ERRATUM

IN the March–April issue of Natural History, the caption for the illustration on page 148 which read "The towering peaks of the Three Brothers and the Yosemite Falls are outlined on the right" was incorrect. It should have been "The towering peaks of the Cathedral Rocks and Bridal-veil Falls are outlined on the right."

CONTRIBUTORS TO THIS ISSUE

Capt. C. W. R. Knight, the author of "Photographing the Ospreys of Gardiner's Island," is a widely known lecturer and photographer of birds. He began his photographic studies before the World War and even managed to carry them on during part of the time he spent in the front line trenches, making pictures of the small birds which frequented No Man's Land. Captain Knight's film of the golden eagle is an especially fine piece of photography and shows the life history of this impressive bird. His article in this number of NATURAL HISTORY relates his experiences in filming ospreys during the summer of 1929, which he spent on Gardiner's Island, situated off the eastern end of Long Island. Captain Knight is the author also of several books on birds, as well as of many magazine articles on eagles, hawks, and falconry.

"With Brush and Palette in the South Seas" by **Miss Caroline Mytinger** tells of some of the obstacles of portrait painting among aborigines. Accompanied only by a woman friend, Miss Mytinger spent four years in the South Seas, a trip which she engineered and financed herself. She is the first person to bring back from these tropic islands any considerable number of paintings which accurately portray fast-disappearing types of man. These paintings, which for some time were on exhibit at the American Museum, are a valuable record of the charm and diversity of these Melanesian peoples.

Dr. Hugo Obermaier, whose article "Altamira—The Cavern of the Stone Age Artists" appears in this issue of NATURAL HISTORY, is one of the world's foremost archæologists. For many years he was associated with Henri Breuil in the Institut de Paleontologie Humaine in Paris. With l'Abbé Breuil, and under the tutelage of Emile Cartailhac, Doctor Obermaier's life has been especially devoted to work in northern Spain. For nearly ten years he has been professor of the prehistory of man in the University of Madrid. His greatest works are *Der Mensch der Vorzeit*, which was published in 1912; and *El Hombre Fosil*, which appeared in 1916, and which is regarded by archæologists of Europe as the most authoritative and up-to-date work on the prehistory of Europe.

Edgar R. Waite, the author of "The Australian Boomerang," was director of the South Australian Museum from 1914 until his death in 1928. From 1888, when he was given his first scientific appointment as sub-curator of the Leeds Museum, Mr. Waite led an active life in his chosen field of museum management. He also undertook considerable editorial work in connection with scientific and natural history publications, and was the author of numerous papers dealing with mammals, birds, fishes, reptiles, amphibians, and some ethnological subjects.

The cover design for this issue of NATURAL HISTORY is from a painting by **Francis L. Jaques** of the American Museum's department of preparation, and is based on the still and motion picture photographs by Captain Knight, the author of "Photographing the Ospreys of Gardiner's Island." The osprey, illustrated in the painting, is one of the most interesting of fish hawks, and Mr. Jaques has caught the bird in a characteristic pose as it is about to seize a fish that is near the surface of the water. Captain Knight's exceptional motion pictures show clearly that upon striking, the osprey often disappears for a moment beneath the water in its attack upon its prey.

Facts concerning other authors have appeared in previous issues of NATURAL HISTORY.

NEW MEMBERS

SINCE the last issue of NATURAL HISTORY, the following persons have been elected members of the American Museum, making the total membership 12,071.

Endowment Member

Mr. FREDERICK G. VOSS.*

Associate Benefactor

Mr. HORACE S. SCARRITT.

Patrons

Mrs. THOMAS S. GATES.
Messrs. HOWARD RUSSELL BUTLER, THOMAS COCHRAN, MADISON GRANT, HOWARD PHIPPS, HAROLD I. PRATT.

Honorary Fellow

Rear Admiral RICHARD EVELYN BYRD.

Honorary Life Members

Dr. CHARLES ERNEST BUNNELL.
Messrs. GILBERT E. GABLE, HERMAN O. MUELLER, NEIL W. RICE.

Life Members

Mesdames JOHN F. ARCHBOLD, STARLING W. CHILDS, HENRY M. TILFORD.
Misses PATRICIA LOVETT, ANNA LORD STRAUSS.
Messrs. GEORGE L. BAGBY, WARD CHENEY, J. F. HOLMES, JOSEPH F. KNAPP, JAMES R. MARTIN, W. E. D. STOKES, JR.

Sustaining Members

Mesdames HENRY W. BULL, WORTHAM JAMES, ROBERT T. MCGUSTY, HENRY L. MOSES, PONSONBY OGLE, WILLIAM C. PEYTON, FRANCIS F. RANDOLPH.
Misses MARY E. CALHOUN, ELISABETH S. CRAFTS, M. ANNIE MILLER.
Dr. MORRIS MANGES.
Messrs. SAMUEL R. BETTS, DANA C. CLARKE, HOMER A. DUNN, ARCHIBALD R. LIVINGSTON, JOHN A. MANNING, WILLIAM C. PEYTON, DANIEL W. STREETER, CARLL TUCKER, CARL WEEKS, C. H. WERNER.

Annual Members

Mesdames A. AVERY BEVIN, FREDERICK F. BREWSTER, WINTHROP BURR, HENRY L. CAMMANN, RUSSELL R. CLEVENGER, W. H. COOLIDGE, JR., MARION B. GIBBONS, A. W. HEWLETT, ISAAC W. JEANES, G. Y. LANSING, LYDIA E. MACKNIGHT, GERTRUDE B. MCCABE, EUGENE M. MOORE, CHARLES M. NORTON, HERMAN G. PLACE, ARCHIBALD, B. ROOSEVELT, J. LOUIS SCHAEFER, FRED LINCOLN SMITH, FRANK M. TAYLOR, A. ROBINSON WHEELWRIGHT, C. H. WILMDERDING.
Misses MITTIE ARNOLD, M. ELISABETH BEERS, MARY E. S. DAVIDSON, SARAH FRASER, ANNE SHERMAN HOYT, EDYTHE K. NEISH, VIRGINIA NEWCOMB.
Dr. G. WYCKOFF CUMMINS, FRED J. ECHEVERRIA, JOHN K. ERGANIAN, WILLIAM C. FISHER, HAROLD THOMAS HYMAN, DAVID M. MARVIN.
Messrs. GORDON BROWN, W. A. CASTLE, STUART EDGAR COLIE, J. C. CUPPIA, CHESTER W. CUTHELL, JOHN H. FELDSCHER, WILLIAM M. FISCHER, FRANK E. GERNON, JAMES C. GOGGIN, WILL R. GREGG, EDWARD W. GREW, ASHTON HAWKINS, HOWARD HEINZ, GEO. C. HOLLERITH, VICTOR HOUSE, CHARLES F. HUTCHINSON, FREDERICK R. JOHNSON, FRED W. KROEHLE, F. H. LEONHARDT, JAMES A. LEYDEN, HENRY G. MCCAUGHEY, MARTIN G. MISSIR, WALTER J. MITCHELL, EDWARD MORRISON, EVAN OWEN, D. JOSEPH PALMER, AMOS PARRISH, J. DUDLEY PETERSON, RANSOM Y. PLACE, HARRY J. POPPER, WILLARD HALL PORTER, JR., ALAN G. RINEHART, ARTHUR J. SACKETT, VINCENT GARMAN SHINKLE, FRANK W. STANTON, G. F. STEELE, WILLIAM MAXSON STILLMAN, DONALD L. STORMS, HOWARD C. SYKES, ROBERT H. THAYER, RUSSELL W. TODD, CARR V. VAN ANDA, WARREN M. WATSON, S. FULLERTON WEAVER, H. K. W. WELCH, BENEDICT S. WISE.

Associate Members

Mesdames ALICE H. BENNETT, GERALDINE W. CARMALT, EDWARD P. CHAPIN, WILLIAM LOWE.
Misses CHERYL AUSCHWITZ, LOUISE BROWN, JOSEPHINE M. DEMAREST.
Doctors S. FOSDICK JONES, LOWELL R. LAUDON, ROBERT J. MAY, EDWIN P. MEINERS, ADOLPH MURIE, BENJAMIN ONRDOFF, H. C. STINCHFIELD.
Commander EDMUND S. R. BRANDT
Messrs. PAUL T. BAHNER, HORACE O. BRIGHT, B. D. BURTT, GEO. H. COLBERT, AUGUSTINE B. CONANT, G. F. COOPE, HENRY W. DARLING, ROGER DEERING, P. R. EGERTON, SIDNEY R. ESTEN, GEORGE A. FESSLER, VICTOR FORBIN, C. C. GLASPEY, HERBERT HASELTINE, L. H. HATCH, DEMATT HENDERSON, JR., J. W. HOUSE, ALLAN G. LEJA, CHAS. J. MALLINSON, WILLIAM H. MCKINNEY, JR., HARRY R. MCPHERSON, B. D. MILLER, CHARLES W. MILLER, RICHARD F. MILLER, O. J. MURIE, G. EDWARD PROUTY, E. GRAYWOOD SMYTH, L. C. TUCKERMAN, FRED D. WATKINS, JR., W. HOWARD WRIGHT.
Master LAURENCE ALLYN BROWN, JR.